

## A Certain Ambiguity A Mathematical Novel

*John Allen Paulos is a master at shedding mathematical lights on our everyday world:What exactly did Lani Guinier say about quotas?What is the probability of identifying a murderer through DNA testing?Which are the real risks to our health and which the phony ones?Employing the same fun-filled, user-friendly, and quirkily insightful approach that put Innumeracy on best-seller lists, Paulos now leads us through the pages of the daily newspaper, revealing the hidden mathematical angles of countless articles. From the Senate, the SATs, and sex to crime, celebrities, and cults, Paulos takes stories that may not seem to involve mathematics at all and demonstrates how mathematical naïveté can put readers at a distinct disadvantage.Whether he’s using chaos theory to puncture economic and environmental predictions, applying logic and self-reference to clarify the hazards of spin doctoring and news compression, or employing arithmetic and common sense to give us a novel perspective on greed and relationships, Paulos never fails to entertain and enlighten.Even if you hated math in school, you’ll love the numerical vignettes in this book.*

*Principia Mathematica* was first published in 1910-13; this is the ninth impression of the second edition of 1925-7. The *Principia* has long been recognised as one of the intellectual landmarks of the century. It was the first book to show clearly the close relationship between mathematics and formal logic. Starting from a minimal number of axioms, Whitehead and Russell display the structure of both kinds of thought. No other book has had such an influence on the subsequent history of mathematical philosophy.

While Taking A Class On Infinity At Stanford In The Late 1980S, Ravi Kapoor Discovers That He Is Confronting The Same Mathematical And Philosophical Dilemmas That His Mathematician Grandfather Had Faced Many Decades Earlier-And That Had Landed Him In Jail. Charged Under An Obscure Blasphemy Law In A Small New Jersey Town In 1919, Vijay Sahni Was Challenged By A Sceptical Judge To Defend His Belief That The Certainty Of Mathematics Can Be Extended To All Human Knowledge-Including Religion. Both Vijay And Ravi Discover The Power-And The Fallibility-Of What Has Long Been Considered The Pinnacle Of Human Certainty, Euclidean Geometry. As Grandfather And Grandson Struggle With The Question Of Whether There Can Ever Be Absolute Certainty In Mathematics Or Life, They Are Forced To Reconsider Their Fundamental Beliefs And Choices. Their Stories Hinge On Their Explorations Of Parallel Developments In The Study Of Geometry And Infinity--And The Mathematics Throughout Is As Rigorous And Fascinating As The Narrative And Characters Are Compelling And Complex. Moving And Enlightening, A Certain Ambiguity Is A Story About What It Means To Face The Extent-And The Limits-Of Human Knowledge. Praise For The Book A Certain Ambiguity Is An Amazing Narrative That Glows With A Vivid Sense Of The Beauty And Wonder Of Mathematics. . . . Mixing Fiction With Non-Fiction, [It] Is A Veritable History Of Mathematics Disguised As A Novel."-Martin Gardner [This Is A Truly Captivating Thriller That Will Take You On A Whirlwind Tour To Infinity-And Beyond. But Be Warned: Once You Start Reading, You Won'T Be Able To Put It Aside Until Finished!]-Eli Maor, Author Of E: The Story Of A Number And The Pythagorean Theorem: A 4,000-Year History By Deftly Blending The Young Man'S Story With Mathematical Ideas And Historical Developments . . . The Authors Succeed Brilliantly In Taking The Reader On A Tour Of Some Of The Major Highlights In The Philosophy Of Mathematics . . . The Book Also Examines, Through The Minds Of Its Characters, The Natures Of Faith . . . And Truth."-Keith Devlin, Author Of The Math Gene

While taking a class on infinity at Stanford in the late 1980s, Ravi Kapoor discovers that he is confronting the same mathematical and philosophical dilemmas that his mathematician grandfather had faced many decades earlier--and that had landed him in jail. Charged under an obscure blasphemy law in a small New Jersey town in 1919, Vijay Sahni is challenged by a skeptical judge to defend his belief that the certainty of mathematics can be extended to all human knowledge--including religion. Together, the two men discover the power--and the fallibility--of what has long been considered the pinnacle of human certainty. Euclidean geometry. As grandfather and grandson struggle with the question of whether there can ever be absolute certainty in mathematics or life, they are forced to reconsider their fundamental beliefs and choices. Their stories hinge on their explorations of parallel developments in the study of geometry and infinity--and the mathematics throughout is as rigorous and fascinating as the narrative and characters are compelling and complex. Moving and enlightening, A Certain Ambiguity is a story about what it means to face the extent--and the limits--of human knowledge.

Mathematics & Common Sense

A Certain Ambiguity

Mind Tools

Making and Breaking Mathematical Sense

Japanese Temple Geometry

The Five Levels of Mathematical Reality

*In the twenty-first century, everyone can benefit from being able to think mathematically. This is not the same as "doing math." The latter usually involves the application of formulas, procedures, and symbolic manipulations; mathematical thinking is a powerful way of thinking about things in the world -- logically, analytically, quantitatively, and with precision. It is not a natural way of thinking, but it can be learned.Mathematicians, scientists, and engineers need to "do math," and it takes many years of college-level education to learn all that is required. Mathematical thinking is valuable to everyone, and can be mastered in about six weeks by anyone who has completed high school mathematics. Mathematical thinking does not have to be about mathematics at all, but parts of mathematics provide the ideal target domain to learn how to think that way, and that is the approach taken by this short but valuable book.The book is written primarily for first and second year students of science, technology, engineering, and mathematics (STEM) at colleges and universities, and for high school students intending to study a STEM subject at university. Many students encounter difficulty going from high school math to college-level mathematics. Even if they did well at math in school, most are knocked off course for a while by the shift in emphasis, from the K-12 focus on mastering procedures to the "mathematical thinking" characteristic of much university mathematics. Though the majority survive the transition, many do not. To help them make the shift, colleges and universities often have a "transition course." This book could serve as a textbook or a supplementary source for such a course.Because of the widespread applicability of mathematical thinking, however, the book has been kept short and written in an engaging style, to make it accessible to anyone who seeks to extend and improve their analytic thinking skills. Going beyond a basic grasp of analytic thinking that everyone can benefit from, the STEM student who truly masters mathematical thinking will find that college-level mathematics goes from being confusing, frustrating, and at times seemingly impossible, to making sense and being hard but doable.Dr. Keith Devlin is a professional mathematician at Stanford University and the author of 31 previous books and over 80 research papers. His books have earned him many awards, including the Pythagoras Prize, the Carl Sagan Award, and the Joint Policy Board for Mathematics Communications Award. He is known to millions of NPR listeners as "the Math Guy" on Weekend Edition with Scott Simon. He writes a popular monthly blog "Devlin's Angle" for the Mathematical Association of America, another blog under the name "profkeithdevlin", and also blogs on various topics for the Huffington Post.*

*Banish math anxiety and give students of all ages a clear roadmap to success Mathematical Mindsets provides practical strategies and activities to help teachers and parents show all children, even those who are convinced that they are bad at math, that they can enjoy and succeed in math. Jo Boaler—Stanford researcher, professor of math education, and expert on math learning—has studied why students don't like math and often fail in math classes. She's followed thousands of students through middle and high schools to study how they learn and to find the most effective ways to unleash the math potential in all students. There is a clear gap between what research has shown to work in teaching math and what happens in schools and at home. This book bridges that gap by turning research findings into practical activities and advice. Boaler translates Carol Dweck's concept of 'mindset' into math teaching and parenting strategies, showing how students can go from self-doubt to strong self-confidence, which is so important to math learning. Boaler reveals the steps that must be taken by schools and parents to improve math education for all. Mathematical Mindsets: Explains how the brain processes mathematics learning Reveals how to turn mistakes and struggles into valuable learning experiences Provides examples of rich mathematical activities to replace rote learning Explains ways to give students a positive math mindset Gives examples of how assessment and grading policies need to change to support real understanding Scores of students hate and fear math, so they end up leaving school without an understanding of basic mathematical concepts. Their evasion and departure hinders math-related pathways and STEM career opportunities. Research has shown very clear methods to change this phenomena, but the information has been confined to research journals—until now. Mathematical Mindsets provides a proven, practical roadmap to mathematics success for any student at any age.*

*A portrait of the eminent twentieth-century mathematician discusses his theorem of incompleteness, relationships with such contemporaries as Albert Einstein, and untimely death as a result of mental instability and self-starvation. The fundamental mathematical tools needed to understand machine learning include linear algebra, analytic geometry, matrix decompositions, vector calculus, optimization, probability and statistics. These topics are traditionally taught in disparate courses, making it hard for data science or computer science students, or professionals, to efficiently learn the mathematics. This self-contained textbook bridges the gap between mathematical and machine learning texts, introducing the mathematical concepts with a minimum of prerequisites. It uses these concepts to derive four central machine learning methods: linear regression, principal component analysis, Gaussian mixture models and support vector machines. For students and others with a mathematical background, these derivations provide a starting point to machine learning texts. For those learning the mathematics for the first time, the methods help build intuition and practical experience with applying mathematical concepts. Every chapter includes worked examples and exercises to test understanding. Programming tutorials are offered on the book's web site.*

Pythagoras' Revenge

*Incompleteness: The Proof and Paradox of Kurt Gödel (Great Discoveries)*

*A Guide to the Power of Numbers, from Car Repair to Modern Physics*

*Infinitesimal: How a Dangerous Mathematical Theory Shaped the Modern World*

*The Parrot's Theorem*

*Mathematics Through the Eyes of Faith*

The celebrated mathematician and philosopher Pythagoras left no writings. But what if he had and the manuscript had never been found? Where would it be located? Two mathematicians, one American, one British, set out, unbeknownst to each other, to find it. In August 1859 Bernhard Riemann, a little-known 32-year old mathematician, presented a paper to the Berlin Academy titled: "On the Number of Prime Numbers Less Than a Given Quantity." In the middle of that paper, Riemann made an incidental remark â€”to the assembled mathematicians that day has proven to be almost cruelly compelling to countless scholars in the ensuing years. Today, after 150 years of careful research and exhaustive study, the question remains. Is the hypothesis true or false? Riemann concerned a straightforward but nevertheless important matter of arithmetic â€” defining a precise formula to track and identify the occurrence of prime numbers. But it is that incidental remark â€” the Riemann Hypothesis â€” that is the truly astonishing able to see beyond the pattern of the primes to discern traces of something mysterious and mathematically elegant shrouded in the shadows â€” subtle variations in the distribution of those prime numbers. Brilliant for its clarity, astounding for its potential importance in mathematics. Indeed, the successful solution to this puzzle would herald a revolution in prime number theory. Proving or disproving it became the greatest challenge of the age. It has become clear that the Riemann Hypothesis, whose resolute grasp, holds the key to a variety of scientific and mathematical investigations. The making and breaking of modern codes, which depend on the properties of the prime numbers, have roots in the Hypothesis. In a series of extraordinary developments during atomic nucleus is connected in ways not yet fully understood to this strange conundrum. Hunting down the solution to the Riemann Hypothesis has become an obsession for many â€” the veritable "great white whale" of mathematical research. Yet despite mathematicians, the Riemann Hypothesis defies resolution. Alternating passages of extraordinarily lucid mathematical exposition with chapters of elegantly composed biography and history, Prime Obsession is a fascinating and fluent account of an epic math and excite the world. Posited a century and a half ago, the Riemann Hypothesis is an intellectual feast for the cognoscenti and the curious alike. Not just a story of numbers and calculations, Prime Obsession is the engrossing tale of a relentless hunt for an consumed by it.

Uncle Petros is a family joke. An ageing recluse, he lives alone in a suburb of Athens, playing chess and tending to his garden. If you didn't know better, you'd surely think he was one of life's failures. But his young nephew suspects otherwise. For Uncle Petr mathematician, brilliant and foolhardy enough to stake everything on solving a problem that had defied all attempts at proof for nearly three centuries - Goldbach's Conjecture. His quest brings him into contact with some of the century's greatest mathematicians and the young Alan Turing. But his struggle is lonely and single-minded, and by the end it has apparently destroyed his life. Until that is a final encounter with his nephew opens up to Petros, once more, the deep mysterious beauty of mathematics. Uncle Petr novel of intellectual adventure, proud genius, the exhilaration of pure mathematics - and the rivalry and antagonism which tormented those who pursue impossible goals.

The Challenge of Sustainability: Corporate Governance in a Complicated World reviews the evolution of five types of corporate governance and their different sustainability objectives. It discusses the challenges for boards in achieving sustainability from an environmental social perspective and introduces the concept of a political tragedy of the commons if boards do what is in the best interests of their profitability only, without considering their responsibilities and unintended consequences for their stakeholders. It explains how ambiguity complicate making sustainable decisions. This book explores ways of helping prevent such negative outcomes. John Zinkin asserts the director's need to reconcile volatility with vision, uncertainty with understanding, complexity with courage and control. To prevent a potential political tragedy of the commons, the book suggests new decision-making processes; treating employees differently; and makes the case for reforming capitalism. It is aimed at managers, board members and all those who influence the company through legal personnel, politicians, activists and general readers interested in applying some of these suggestions in their roles as stakeholders, managers and directors.

Applied Mathematics for Database Professionals

The Principles of Mathematics

Group Theory in the Bedroom, and Other Mathematical Diversions

How Not to Be Wrong

A Linguistic and Philosophical Investigation

Sacred Mathematics

**This book is an introduction to the language and standard proof methods of mathematics. It is a bridge from the computational courses (such as calculus or differential equations) that students typically encounter in their first year of college to a more abstract outlook. It lays a foundation for more theoretical courses such as topology, analysis and abstract algebra. Although it may be more meaningful to the student who has had some calculus, there is really no prerequisite other than a measure of mathematical maturity.**

**The Language of Mathematics** was awarded the E.W. Beth Dissertation Prize for outstanding dissertations in the fields of logic, language, and information. It innovatively combines techniques from linguistics, philosophy of mathematics, and computation to give the first wide-ranging analysis of mathematical language. It focuses particularly on a method for determining the complete meaning of mathematical texts and on resolving technical deficiencies in all standard accounts of the foundations of mathematics. "The thesis does far more than is required for a PhD: it is more like a lifetime's work packed into three years, and is a truly exceptional achievement." Timothy Gowers

**Originally published: Boston: Houghton Mifflin, 1987.**

**In this charming volume, a noted English mathematician uses humor and anecdote to illuminate the concepts of groups, sets, subsets, topology, Boolean algebra, and other mathematical subjects. 200 illustrations.**

**Classic Puzzles, Paradoxes, and Problems : Number Theory, Algebra, Geometry, Probability, Topology, Game Theory, Infinity, and Other Topics of Recreational Mathematics**

**A Case of Creative Tension**

**Histories and Philosophies of Mathematical Practice**

**Introduction to Mathematical Thinking**

**A Mathematical Mystery**

Russell's classic The Principles of Mathematics sets forth his landmark thesis that mathematics and logic are identical--that what is commonly called mathematics is simply later deductions from logical premises.

This book touches on an area seldom explored: the mathematical underpinnings of the relational database. The topic is important, but far too often ignored. This is the first book to explain the underlying math in a way that 's accessible to database professionals. Just as importantly, it not more so, this book goes beyond the abstract by showing readers how to apply that math in ways that will make them more productive in their jobs. What 's in this book will "open the eyes" of most readers to the great power, elegance, and simplicity inherent in relational database technology.

From the author of the best-selling Einstein 's Dreams comes a wonderfully original, deeply moving, and wryly funny novel about the clash between the absolutes of science and the vagaries of human experience. Bennett always knew he would live a life of science. From the homemade rockets and experiments of his childhood to the complex equations he solved as a professor of physics, his vision has transformed the uncertainty and frailty of life into an order and beauty that he inhabits with deep satisfaction. But his vision betrays him, revealing a profound incompleteness, an inadequacy to confront the contradictions his life: the black maid who raises him and loves him but cannot welcome him into her own house, the mentally absent father who wishes he 'd died a hero in World War II, the self-destructive wife who invites Bennett 's cruelty. As Bennett struggles between reason and intuition, he slowly learns to allow the imperfections of daily life—the chaos he has worked so hard to control—to broaden his understanding of the world and his place in it. Written with lyrical sparseness, hilarity mixed with sadness, the story of Bennett 's struggle becomes both a beautifully rendered portrait of the emotional life of a scientist and a resonant tale of the disillusionment that haunts us all.

WINNER OF THE NATIONAL JEWISH BOOK AWARD FOR OUTSTANDING DEBUT FICTION For readers of This Is Where I Leave You and Everything Is Illuminated, “ a brilliant and compelling family saga full of warmth, paths, history and humor ” (Jonathan Evison, author of West of Here) When the greatest female mathematician in history passes away, her son, Alexander “ Sasha ” Karnokovitch, just wants to mourn his mother in peace. But rumor has it the notoriously eccentric Polish é migr é has solved one of the most difficult problems in all of mathematics, and has spitefully taken the solution to her grave. As a ragtag group of mathematicians from around the world descends upon Rachela ’ s shiva, determined to find the proof or solve it for themselves—even if it means prying up the floorboards for notes or desperately scrutinizing the mutterings of her African Grey parrot—Sasha must come to terms with his mother ’ s outsized influence on his life. Spanning decades and continents, from a crowded living room in Madison, Wisconsin, to the windswept beach on the Barents Sea where a young Rachela had her first mathematical breakthrough, The Mathematician ’ s Shiva is an unexpectedly moving and uproariously funny novel that captures humanity ’ s drive not just to survive, but to achieve the impossible.

Mathematics for Machine Learning

The Colossal Book of Mathematics

Using Ambiguity, Contradiction, and Paradox to Create Mathematics

Humanizing Mathematics and its Philosophy

Rotations, Quaternions, and Double Groups

A Novel

From the Preface: "This book is addressed to all who are curious about the nature of mathematics and its role in society. It is neither a text book nor a specialists' book. It consists of a number of loosely linked essays that may be read independently and for which I have tried to provide a leitmotif by throwing light on the relationship between m

Combining mathematical rigor with light romance, Math Girls is a unique introduction to advanced mathematics, delivered through the eyes of three students as they learn to deal with problems seldom found in textbooks.

A Certain AmbiguityA Mathematical NovelPrinceton University Press

To many outsiders, mathematicians appear to think like computers, grimly grinding away with a strict formal logic and moving methodically—even algorithmically—from one black-and-white deduction to another. Yet mathematicians often describe their most important breakthroughs as creative, intuitive responses to ambiguity, contradiction, and paradox. A unique examination of this less-familiar aspect of mathematics, How Mathematicians Think reveals that mathematics is a profoundly creative activity and not just a body of formalized rules and results. Nonlogical qualities, William Byers shows, play an essential role in mathematics. Ambiguities, contradictions, and paradoxes can arise when ideas developed in different contexts come into contact. Uncertainties and conflicts do not impede but rather spur the development of mathematics.

Creativity often means bringing apparently incompatible perspectives together as complementary aspects of a new, more subtle theory. The secret of mathematics is not to be found only in its logical structure. The creative dimensions of mathematical work have great implications for our notions of mathematical and scientific truth, and How Mathematicians Think provides a novel approach to many fundamental questions. Is mathematics objectively true? Is it discovered or invented? And is there such a thing as a "final" scientific theory? Ultimately, How Mathematicians Think shows that the nature of mathematical thinking can teach us a great deal about the human condition itself.

Bernhard Riemann and the Greatest Unsolved Problem in Mathematics

Where Mathematics Come From How The Embodied Mind Brings Mathematics Into Being

An Introduction to Mathematical Modeling

How Mathematicians Think

The Mathematician's Shiva

The Power of Mathematical Thinking

*In line with the emerging field of philosophy of mathematical practice, this book pushes the philosophy of mathematics away from questions about the reality and truth of mathematical entities and statements and toward a focus on what mathematicians actually do—and how that evolves and changes over time. How do new mathematical entities come to be? What internal, natural, cognitive, and social constraints shape mathematical cultures? How do mathematical signs form and reform their meanings? How can we model the cognitive processes at play in mathematical evolution? And how does mathematics tie together ideas, reality, and applications? Roi Wagner uniquely combines philosophical, historical, and cognitive studies to paint a fully rounded image of mathematics not as an absolute ideal but as a human endeavor that takes shape in specific social and institutional contexts. The book builds on ancient, medieval, and modern case studies to confront philosophical reconstructions and cutting-edge cognitive theories. It focuses on the contingent semiotic and interpretive dimensions of mathematical practice, rather than on mathematics' claim to universal or fundamental truths, in order to explore not only what mathematics is, but also what it could be. Along the way, Wagner challenges conventional views that mathematical signs represent fixed, ideal entities; that mathematical cognition is a rigid transfer of inferences between formal domains; and that mathematics' exceptional consensus is due to the subject's underlying reality. The result is a revisionist account of mathematical philosophy that will interest mathematicians, philosophers, and historians of science alike.*

*Examination of essential topics and theorems assumes no background in logic. "Undoubtedly a major addition to the literature of mathematical logic."* – Bulletin of the American Mathematical Society. 1978 edition.

Mr. Ruche, a Parisian bookseller, receives a bequest from a long lost friend in the Amazon of a vast library of math books, which propels him into a great exploration of the story of mathematics. Meanwhile Max, whose family lives with Mr. Ruche, takes in a voluble parrot who will discuss math with anyone. When Mr. Ruche learns of his friend's mysterious death in a Brazilian rainforest, he decides that with the parrot's help he will use these books to teach Max and his brother and sister the mysteries of Euclid's Elements, Pythagoras's Theorem and the countless other mathematical wonders. But soon it becomes clear that Mr. Ruche has inherited the library for reasons other than enlightenment, and before he knows it the household is racing to prevent the parrot and vital, new theorems from falling into the wrong hands. An immediate bestseller when first published in France, The Parrot's Theorem charmingly combines a straightforward history of mathematics and a first-rate murder mystery.

Book description to come.

Concepts of Modern Mathematics

Mathematical Mindsets

Logic for Mathematicians

A Mathematical Novel

A Mathematician Reads the Newspaper

GOOD BENITO

Ever since it was first published in 1930, William Empson's Seven Types of Ambiguity has been perceived as a milestone in literary criticism—far from being an impediment to communication, ambiguity now seemed an index of poetic richness and expressive power. Little, however, has been written on the broader trajectory of Western thought about ambiguity before Empson; as a result, the nature of his innovation has been poorly understood. A History of Ambiguity remedies this omission. Starting with classical grammar and rhetoric, and moving on to moral theology, law, biblical exegesis, German philosophy, and literary criticism, Anthony Ossa-Richardson explores the many ways in which readers and theorists posited, denied, conceptualised, and argued over the existence of multiple meanings in texts between antiquity and the twentieth century. This process took on a variety of interconnected forms, from the Renaissance delight in the 'elegance' of ambiguities in Horace, through the extraordinary Catholic claim that Scripture could contain multiple literal—and not just allegorical—senses, to the theory of dramatic irony developed in the nineteenth century, a theory intertwined with discoveries of the double meanings in Greek tragedy. Such narratives are not merely of antiquarian interest: rather, they provide an insight into the foundations of modern criticism, revealing deep resonances between acts of interpretation in disparate eras and contexts. A History of Ambiguity lays bare the long tradition of efforts to liberate language, and even a poet's intention, from the strictures of a single meaning.

Accessible text features over 100 reality-based examples pulled from the science, engineering, and operations research fields. Prerequisites: ordinary differential equations, continuous probability. Numerous references. Includes 27 black-and-white figures. 1978 edition.

Pulsing with drama and excitement, Infinitesimal celebrates the spirit of discovery, innovation, and intellectual achievement—and it will forever change the way you look at a simple line. On August 10, 1632, five men in flowing black robes convened in a somber Roman palazzo to pass judgment on a deceptively simple proposition: that a continuous line is composed of distinct and infinitely tiny parts. With the stroke of a pen the Jesuit fathers banned the doctrine of infinitesimals, announcing that it could never be taught or even mentioned. The concept was deemed dangerous and subversive, a threat to the belief that the world was an orderly place, governed by a strict and unchanging set of rules. If infinitesimals were ever accepted, the Jesuits feared, the entire world would be plunged into chaos. In Infinitesimal, the award-winning historian Amir Alexander exposes the deep-seated reasons behind the rulings of the Jesuits and shows how the doctrine persisted, becoming the foundation of calculus and much of modern mathematics and technology. Indeed, not everyone agreed with the Jesuits. Philosophers, scientists, and mathematicians across Europe embraced infinitesimals as the key to scientific progress, freedom of thought, and a more tolerant society. As Alexander reveals, it wasn't long before the two camps set off on a war that pitted Europe's forces of hierarchy and order against those of pluralism and change. The story takes us from the bloody battlefields of Europe's religious wars and the English Civil War and into the lives of the greatest mathematicians and philosophers of the day, including Galileo and Isaac Newton, Cardinal Bellarmine and Thomas Hobbes, and Christopher Clavius and John Wallis. In Italy, the defeat of the infinitely small signaled an end to that land's reign as the cultural heart of Europe, and in England, the triumph of infinitesimals helped launch the island nation on a course that would make it the world's first modern state. From the imperial cities of Germany to the green hills of Surrey, from the papal palace in Rome to the halls of the Royal Society of London, Alexander demonstrates how a disagreement over a mathematical concept became a contest over the heavens and the earth. The legitimacy of popes and kings, as well as our beliefs in human liberty and progressive science, were at stake—the soul of the modern world hinged on the infinitesimal.

In How Math Explains the World, mathematician Stein reveals how seemingly arcane mathematical investigations and discoveries have led to bigger, more world-shaking insights into the nature of our world. In the four main sections of the book, Stein tells the stories of the mathematical thinkers who discerned some of the most fundamental aspects of our universe. From their successes and failures, delusions, and even duels, the trajectories of their innovations—and their impact on society—are traced in this fascinating narrative. Quantum mechanics, space-time, chaos theory and the workings of complex systems, and the impossibility of a "perfect" democracy are all here. Stein's book is both mind-bending and practical, as he explains the best way for a salesman to plan a trip, examines why any thought you could have is imbedded in the number  $\pi$ , and—perhaps most importantly—answers one of the modern world's toughest questions: why the garage can never get your car repaired on time. Friendly, entertaining, and fun, How Math Explains the World is the first book by one of California's most popular math teachers, a veteran of both "math for poets" and Princeton's Institute for Advanced Studies. And it's perfect for any reader wanting to know how math makes both science and the world tick.

Prime Obsession

Uncle Petros and Goldbach's Conjecture

How Math Explains the World

The Challenge of Sustainability

Essays Celebrating the 90th Birthday of Reuben Hersh

Principia Mathematica

*"Witty, compelling, and just plain fun to read . . ." —Evelyn Lamb, Scientific American* *The Freakonomics of math—a math-world superstar unveils the hidden beauty and logic of the world and puts its power in our hands. The math we learn in school can seem like a dull set of rules, laid down by the ancients and not to be questioned. In How Not to Be Wrong, Jordan Ellenberg shows us how terribly limiting this view is: Math isn't confined to abstract incidents that never occur in real life, but rather touches everything we do—the whole world is shot through with it. Math allows us to see the hidden structures underneath the messy and chaotic surface of our world. It's a science of not being wrong, hammered out by centuries of hard work and argument. Armed with the tools of mathematics, we can see through to the true meaning of information we take for granted: How early should you get to the airport? What does "public opinion" really represent? Why do tall parents have shorter children? Who really won Florida in 2000? And how likely are you, really, to develop cancer? How Not to Be Wrong presents the surprising revelations behind all of these questions and many more, using the mathematician's method of analyzing life and exposing the hard-won insights of the academic community to the layman—minus the jargon. Ellenberg chases mathematical threads through a vast range of time and space, from the everyday to the cosmic, encountering, among other things, baseball, Reaganomics, daring lottery schemes, Voltaire, the replicability crisis in psychology, Italian Renaissance painting, artificial languages, the development of non-Euclidean geometry, the coming obesity apocalypse, Antonin Scalia's views on crime and punishment, the psychology of slime molds, what Facebook can and can't figure out about you, and the existence of God. Ellenberg pulls from history as well as from the latest theoretical developments to provide those not trained in math with the knowledge they need. Math, as Ellenberg says, is "an atomic-powered prosthesis that you attach to your common sense, vastly multiplying its reach and strength."* *With the tools of mathematics in hand, you can understand the world in a deeper, more meaningful way. How Not to Be Wrong will show you how.*

*An Award-Winning Essayist Plies His Craft* Brian Hayes is one of the most accomplished essayists active today—a claim supported not only by his prolific and continuing high-quality output but also by such honors as the National Magazine Award for his commemorative Y2K essay titled "Clock of Ages," published in the November/December 1999 issue of *The Sciences* magazine. (The also-rans that year included Tom Wolfe, Verlyn Klinkenborg, and Oliver Sacks.) Hayes's work in this genre has also appeared in such anthologies as *The Best American Magazine Writing*, *The Best American Science and Nature Writing*, and *The Norton Reader*. Here he offers us a selection of his most memorable and accessible pieces—including "Clock of Ages"—embellishing them with an overall, scene-setting preface, reconfigured illustrations, and a refreshingly self-critical "Afterthoughts" section appended to each essay.

*Provides an in-depth analysis of the cognitive science of mathematical ideas that argues that conceptual metaphor plays a definitive role in mathematical ideas, exploring such concepts as arithmetic, algebra, sets, logic, and infinity. 20,000 first printing.*

*This self-contained text presents a consistent description of the geometric and quaternionic treatment of rotation operators, employing methods that lead to a rigorous formulation and offering complete solutions to many illustrative problems. Geared toward upper-level undergraduates and graduate students, the book begins with chapters covering the fundamentals of symmetries, matrices, and groups, and it presents a primer on rotations and rotation matrices. Subsequent chapters explore rotations and angular momentum, tensor bases, the bilinear transformation, projective representations, and the geometry, topology, and algebra of rotations. Some familiarity with the basics of group theory is assumed, but the text assists students in developing the requisite mathematical tools as necessary.*

*The Language of Mathematics*

*Cartesian Method and the Problem of Reduction*

*A History of Ambiguity*

*Math Girls*

*Book of Proof*

*Corporate Governance in a Complicated World*

Between the seventeenth and nineteenth centuries Japan was totally isolated from the West by imperial decree. During that time, a unique brand of homegrown mathematics flourished, one that was completely uninfluenced by developments in Western mathematics. People from all walks of life—samurai, farmers, and merchants—inscribed a wide variety of geometry problems on wooden tablets called sangaku and hung them in Buddhist temples and Shinto shrines throughout Japan. *Sacred Mathematics* is the first book published in the West to fully examine this tantalizing—and incredibly beautiful—mathematical tradition. Fukagawa Hidetoshi and Tony Rothman present for the first time in English excerpts from the travel diary of a nineteenth-century Japanese mathematician, Yamaguchi Kanzan, who journeyed on foot throughout Japan to collect temple geometry problems. The authors set this fascinating travel narrative—and almost everything else that is known about temple geometry—within the broader cultural and historical context of the period. They explain the sacred and devotional aspects of sangaku, and reveal how Japanese folk mathematicians discovered many well-known theorems independently of mathematicians in the West—and in some cases much earlier. The book is generously illustrated with photographs of the tablets and stunning artwork of the period. Then there are the geometry problems themselves, nearly two hundred of them, fully illustrated and ranging from the utterly simple to the virtually impossible. Solutions for most are provided. A unique book in every respect, *Sacred Mathematics* demonstrates how mathematical thinking can vary by culture yet transcend cultural and geographic boundaries.

The author presents a selection of pieces from his *Scientific American* "Mathematical Games" column, presenting puzzles and concepts that range from arithmetic and geometrical games to the meaning of M.C. Escher's artwork.

This *Festschrift* contains numerous colorful and eclectic essays from well-known mathematicians, philosophers, logicians, and linguists celebrating the 90th birthday of Reuben Hersh. The essays offer, in part, attempts to answer the following questions set forth by Reuben himself as a focus for this volume: Can practicing mathematicians, as such, contribute anything to the philosophy of math? Can or should philosophers of math, as such, say anything to practicing mathematicians? Twenty or fifty years from now, what will be similar, and what will, or could, or should be altogether different: About the philosophy of math? About math education? About math research institutions? About data processing and scientific computing? The essays also offer glimpses into Reuben's fertile mind and his lasting influence on the mathematical community, as well as revealing the diverse roots, obstacles and philosophical dispositions that characterize the working lives of mathematicians. With contributions from a veritable "who's who" list of 20th century luminaries from mathematics and philosophy, as well as from Reuben himself, this volume will appeal to a wide variety of readers from curious undergraduates to prominent mathematicians.

*Unleashing Students' Potential through Creative Math, Inspiring Messages and Innovative Teaching*