



[Books] Our Mathematical Universe: My Quest For The Ultimate Nature Of Reality

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Our Mathematical Universe-Max Tegmark 2014-01-07 Max Tegmark leads us on an astonishing journey through past, present and future, and through the physics, astronomy and mathematics that are the foundation of his work, most particularly his hypothesis that our physical reality is a mathematical structure and his theory of the ultimate multiverse. In a dazzling combination of both popular and groundbreaking science, he not only helps us grasp his often mind-boggling theories, but he also shares with us some of the often surprising triumphs and disappointments that have shaped his life as a scientist. Fascinating from first to last—this is a book that has already prompted the attention and admiration of some of the most prominent scientists and mathematicians.

Our Mathematical Universe-Max Tegmark 2014 The author discusses his life and work in physics, astronomy, and mathematics, most particularly his hypothesis that our physical reality is a mathematical structure and his theory of the ultimate multiverse.

Our Mathematical Universe-Max Tegmark 2014-01-07 Max Tegmark leads us on an astonishing journey through past, present, and future, and through the physics, astronomy, and mathematics that are the foundation of his work, most particularly his hypothesis that our physical reality is a mathematical structure and his theory of the ultimate multiverse. In a dazzling combination of both popular and groundbreaking science, he not only helps us grasp his often mind-boggling theories, but he also shares with us some of the often surprising triumphs and disappointments that have shaped his life as a scientist. Fascinating from first to last - here is a book for the full science-reading spectrum. Max Tegmark is author or co-author of more than 200 technical papers, twelve of which have been cited more than 500 times. He has featured in dozens of science documentaries, and his work with the SDSS collaboration on galaxy clustering shared the first prize in Science magazine's "Breakthrough of the Year: 2003". He holds a Ph.D from the University of California, Berkeley, and is a physics professor at MIT.

The Universe Speaks in Numbers-Graham Farmelo 2019-05-28 How math helps us solve the universe's deepest mysteries One of the great insights of science is that the universe has an underlying order. The supreme goal of physicists is to understand this order through laws that describe the behavior of the most basic particles and the forces between them. For centuries, we have searched for these laws by studying the results of experiments. Since the 1970s, however, experiments at the world's most powerful atom-smashers have offered few new clues. So some of the world's leading physicists have looked to a different source of insight: modern mathematics. These physicists are sometimes accused of doing 'fairy-tale physics', unrelated to the real world. But in *The Universe Speaks in Numbers*, award-winning science writer and biographer Farmelo argues that the physics they are doing is based squarely on the well-established principles of quantum theory and relativity, and part of a tradition dating back to Isaac Newton. With unprecedented access to some of the world's greatest scientific minds, Farmelo offers a vivid, behind-the-scenes account of the blossoming relationship between mathematics and physics and the research that could revolutionize our understanding of reality. A masterful account of the some of the most groundbreaking ideas in physics in the past four decades. *The Universe Speaks in Numbers* is essential reading for anyone interested in the quest to discover the fundamental laws of nature.

Is God a Mathematician?-Mario Livio 2011-02-22 Bestselling author and astrophysicist Mario Livio examines the lives and theories of history's greatest mathematicians to ask how—if mathematics is an abstract construction of the human mind—it can so perfectly explain the physical

world. Nobel Laureate Eugene Wigner once wondered about “the unreasonable effectiveness of mathematics” in the formulation of the laws of nature. *Is God a Mathematician?* investigates why mathematics is as powerful as it is. From ancient times to the present, scientists and philosophers have marveled at how such a seemingly abstract discipline could so perfectly explain the natural world. More than that—mathematics has often made predictions, for example, about subatomic particles or cosmic phenomena that were unknown at the time, but later were proven to be true. Is mathematics ultimately invented or discovered? If, as Einstein insisted, mathematics is “a product of human thought that is independent of experience,” how can it so accurately describe and even predict the world around us? Physicist and author Mario Livio brilliantly explores mathematical ideas from Pythagoras to the present day as he shows us how intriguing questions and ingenious answers have led to ever deeper insights into our world. This fascinating book will interest anyone curious about the human mind, the scientific world, and the relationship between them.

Programming the Universe-Seth Lloyd 2006-03-14 Is the universe actually a giant quantum computer? According to Seth Lloyd, the answer is yes. All interactions between particles in the universe, Lloyd explains, convey not only energy but also information—in other words, particles not only collide, they compute. What is the entire universe computing, ultimately? “Its own dynamical evolution,” he says. “As the computation proceeds, reality unfolds.” *Programming the Universe*, a wonderfully accessible book, presents an original and compelling vision of reality, revealing our world in an entirely new light.

Consistent Quantum Theory-Robert B. Griffiths 2003-11-13 A clear and accessible presentation of quantum theory, suitable for researchers yet accessible to graduates.

Life 3.0-Max Tegmark 2017-08-29 New York Times Best Seller How will Artificial Intelligence affect crime, war, justice, jobs, society and our very sense of being human? The rise of AI has the potential to transform our future more than any other technology—and there's nobody better qualified or situated to explore that future than Max Tegmark, an MIT professor who's helped mainstream research on how to keep AI beneficial. How can we grow our prosperity through automation without leaving people lacking income or purpose? What career advice should we give today's kids? How can we make future AI systems more robust, so that they do what we want without crashing, malfunctioning or getting hacked? Should we fear an arms race in lethal autonomous weapons? Will machines eventually outsmart us at all tasks, replacing humans on the job market and perhaps altogether? Will AI help life flourish like never before or give us more power than we can handle? What sort of future do you want? This book empowers you to join what may be the most important conversation of our time. It doesn't shy away from the full range of viewpoints or from the most controversial issues—from superintelligence to meaning, consciousness and the ultimate physical limits on life in the cosmos.

The Elegant Universe-Brian Greene 2011-05-31 'Compulsively readable...Green threatens to do for string theory what Stephen Hawking did for holes' New York Times In this international bestseller, Columbia University professor Brian Greene provides, in layman's terms, a comprehensive demystification of string theory. Greene, one of the world's leading string theorists, peels away layers of the unknown, through introducing concepts from quantum mechanics to general relativity, to reveal a universe that consists of eleven dimensions. Accessible and enlightening, Greene's inimitable blend of expert scientific insight and literary ingenuity makes *The Elegant Universe* an exhilarating read that brings us closer to understanding how our magnificent universe works. 'Utterly absorbing...a brilliant achievement. An accessible, equationless account of strings' Sunday Telegraph

Theory of Nothing-Russell Standish 2006 The "Theory of Nothing" explores the radical idea that the reality we see around us is but one of an infinite "library" of alternate realities, the sum of which contains no information and is in fact "Nothing". The necessity for observed reality to be consistent with the observer's existence implies a strong connection between fundamental physics and cognitive science. A revolutionary understanding of why physics has the form it does, and why our minds are the way they are is forged.

God and the Multiverse-Klaas Kraay 2014-11-13 In recent decades, scientific theories have postulated the existence of many universes beyond our own. The details and implications of these theories are hotly contested. Some philosophers argue that these scientific models count against the existence of God. Others, however, argue that if God exists, a multiverse is precisely what we should expect to find. Moreover, these philosophers claim that the idea of a divinely created multiverse can help believers in God respond to certain arguments for atheism. These proposals are, of course, also extremely controversial. This volume collects together twelve newly published essays - two by physicists, and ten by philosophers - that discuss various aspects of this issue. Some of the essays support the idea of a divinely created multiverse; others oppose it. Scientific, philosophical, and theological issues are considered.

Lectures on the Philosophy of Mathematics-Joel David Hamkins 2021-02-02 An introduction to the philosophy of mathematics grounded in mathematics and motivated by mathematical inquiry and practice. In this book, Joel David Hamkins offers an introduction to the philosophy of mathematics that is grounded in mathematics and motivated by mathematical inquiry and practice. He treats philosophical issues as they arise organically in mathematics, discussing such topics as platonism, realism, logicism, structuralism, formalism, infinity, and intuitionism in mathematical contexts. He organizes the book by mathematical themes--numbers, rigor, geometry, proof, computability, incompleteness, and set theory--that give rise again and again to philosophical considerations.

Time Reborn-Lee Smolin 2013-04-23 In *Time Reborn*, Lee Smolin, one of our foremost physicists and thinkers offers a radical new view of the nature of time and the cosmos. Nothing seems more real than time passing. We experience life itself as a succession of moments. Yet throughout history, the idea that time is an illusion has been a religious and philosophical commonplace. We identify certain truths as 'eternal' constants, from moral principles to the laws of mathematics and nature: these are laws that exist not inside time, but outside it. From Newton and Einstein to today's string theorists and quantum physicists, the widest consensus is that the universe is governed by absolute, timeless laws. In *Time Reborn*, Lee Smolin argues that this denial of time is holding back both physics, and our understanding of the universe. We need a major revolution in scientific thought: one that embraces the reality of time and places it at the centre of our thinking. $E=mc^2$ may equal mc^2 now, but that wasn't always the case. Similarly, as our understanding of the universe develops, Newton's fundamental laws might not remain so fundamental. Time, Smolin concludes, is not an illusion: it is the best clue we have to fundamental reality. *Time Reborn* explains how the true nature of time impacts on us, our world, and our universe. 'The strongest dose of clarity in written form to have come along in decades. The implications go far beyond physics, to economics, politics, and personal philosophy. *Time Reborn* places reality above theory in stronger and clearer terms than ever before, and the result is a path to better theory and potentially to a better society as well. Will no doubt be remembered as one of the essential books of the 21st century' Jaron Lanier [Praise for Lee Smolin's *The Trouble With Physics*]: 'The best book about contemporary science written for the layman that I have ever read . . . Read this book. Twice' Sunday Times 'Unusually broad and deep . . . his critical judgments are exceptionally penetrating' Roger Penrose 'Brave, uniquely well-informed . . . does a tremendous job' Mail on Sunday Lee Smolin is a theoretical physicist who has made important contributions to the search for quantum gravity. Born in New York City, he was educated at Hampshire College and Harvard University. Since 2001 he is a founding faculty member at Perimeter Institute for Theoretical Physics. His three earlier books explore philosophical issues raised by contemporary physics and cosmology. They are *Life of the Cosmos* (1997), *Three Roads to Quantum Gravity* (2001) and *The Trouble with Physics* (2006). He lives in Toronto.

Fractal Worlds-Michael Frame 2016-01-01 In this essential primer, mathematician Michael Frame, a close collaborator with Benoit Mandelbrot, the founder of fractal geometry, and poet Amelia Urry explore the amazing world of fractals as they appear in nature, art, medicine, and technology

Fringe Science-Kevin R. Grazier 2011 Presents essays on the television show "Fringe" from scientists, science writers, science fiction authors, and historians that examine the show's themes and how its treatment of science compares with science in the real world.

The Grand Design-Stephen Hawking 2010-09-07 #1 NEW YORK TIMES BESTSELLER When and how did the universe begin? Why are we here? What is the nature of reality? Is the apparent "grand design" of our universe evidence of a benevolent creator who set things in motion—or does science offer another explanation? In this startling and lavishly illustrated book, Stephen Hawking and Leonard Mlodinow present the most recent scientific thinking about these and other abiding mysteries of the universe, in nontechnical language marked by brilliance and simplicity. According to quantum theory, the cosmos does not have just a single existence or history. The authors explain that we ourselves are the product of quantum fluctuations in the early universe, and show how quantum theory predicts the "multiverse"—the idea that ours is just one of many universes that appeared spontaneously out of nothing, each with different laws of nature. They conclude with a riveting assessment of M-theory, an explanation of the laws governing our universe that is currently the only viable candidate for a "theory of everything": the unified theory that Einstein was looking for, which, if confirmed, would represent the ultimate triumph of human reason.

Universe on a T-Shirt-Dan Falk 2013-05-01 No scientific quest is as compelling as the search for the key to understand the universe—the elusive unified "Theory of Everything"—a theory so concise it could fit on a T-shirt. Lively and thought-provoking, *Universe on a T-Shirt* tells the fascinating story of the search for the Holy Grail of physics. Dan Falk places this intriguing story in its historical context, tracing the quest from ancient Greece to the breakthroughs of Newton, Maxwell, and Einstein, to the excitement over string theory and today's efforts to merge quantum theory with general relativity. With as much emphasis on history as on science, Falk's accessible approach is ideal for anyone intrigued by the advances in modern physics but still wondering what theoretical physicists are searching for, and why. Today's physicists use sophisticated methods, but their goal—the search for simplicity—has not changed since the time of the ancient Greeks. *Universe on a T-Shirt* is filled with quirky personalities, brilliant minds, and bold ideas—high science and high drama. "An admirably concise and comprehensive overview of cosmology . . . [that] offers intriguing insights into the philosophic and personal outlooks motivating the scientists involved, from the ancient Greeks through Newton and Einstein . . . [and] Stephen Hawking and Ed Witten."—Booklist

This Explains Everything-John Brockman 2013-01-22 Drawn from the cutting-edge frontiers of science, *This Explains Everything* will revolutionize your understanding of the world. What is your favorite deep, elegant, or beautiful explanation? This is the question John Brockman, publisher of Edge.org ("The world's smartest website"—The Guardian), posed to the world's most influential minds. Flowing from the horizons of physics, economics, psychology, neuroscience, and more, *This Explains Everything* presents 150 of the most surprising and brilliant theories of the way of our minds, societies, and universe work. Jared Diamond on biological electricity • Nassim Nicholas Taleb on positive stress • Steven Pinker on the deep genetic roots of human conflict • Richard Dawkins on pattern recognition • Nobel Prize-winning physicist Frank Wilczek on simplicity • Lisa Randall on the Higgs mechanism • BRIAN Eno on the limits of intuition • Richard Thaler on the power of commitment • V. S. Ramachandran on the "neural code" of consciousness • Nobel Prize winner ERIC KANDEL on the power of psychotherapy • Mihaly Csikszentmihalyi on "Lord Acton's Dictum" • Lawrence M. Krauss on the unification of electricity and magnetism • plus contributions by Martin J. Rees • Kevin Kelly • Clay Shirky • Daniel C. Dennett • Sherry Turkle • Philip Zimbardo • Lee Smolin • Rebecca Newberger Goldstein • Seth Lloyd • Stewart Brand • George Dyson • Matt Ridley

Quantum Computing Since Democritus-Scott Aaronson 2013-03-14 Takes students and researchers on a tour through some of the deepest ideas of maths, computer science and physics.

Love and Math-Edward Frenkel 2013-10-01 An awesome, globe-spanning, and New York Times best-selling journey through the beauty and power of mathematics. What if you had to take an art class in which you were only taught how to paint a fence? What if you were never shown the paintings of van Gogh and Picasso, weren't even told they existed? Alas, this is how math is taught, and so for most of us it becomes the intellectual equivalent of

watching paint dry. In *Love and Math*, renowned mathematician Edward Frenkel reveals a side of math we've never seen, suffused with all the beauty and elegance of a work of art. In this heartfelt and passionate book, Frenkel shows that mathematics, far from occupying a specialist niche, goes to the heart of all matter, uniting us across cultures, time, and space. *Love and Math* tells two intertwined stories: of the wonders of mathematics and of one young man's journey learning and living it. Having braved a discriminatory educational system to become one of the twenty-first century's leading mathematicians, Frenkel now works on one of the biggest ideas to come out of math in the last 50 years: the Langlands Program. Considered by many to be a Grand Unified Theory of mathematics, the Langlands Program enables researchers to translate findings from one field to another so that they can solve problems, such as Fermat's last theorem, that had seemed intractable before. At its core, *Love and Math* is a story about accessing a new way of thinking, which can enrich our lives and empower us to better understand the world and our place in it. It is an invitation to discover the magic hidden universe of mathematics.

I Am a Strange Loop-Douglas R. Hofstadter 2007-03-27 An original, endlessly thought-provoking, and controversial look at the nature of consciousness and identity argues that the key to understanding selves and consciousness is the "strange loop," a special kind of abstract feedback loop inhabiting our brains.

Prime Obsession-John Derbyshire 2003-04-15 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 "a guess, a hypothesis. What he tossed out 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's basic inquiry, the primary topic of his paper, concerned a straightforward but nevertheless important matter of arithmetic "defining a precise formula to track and identify the occurrence of prime numbers. But it is that incidental remark "the Riemann Hypothesis" that is the truly astonishing legacy of his 1859 paper. Because Riemann was able to see beyond the pattern of the primes to discern traces of something mysterious and mathematically elegant shrouded in the shadows "subtle variations in the distribution of those prime numbers. Brilliant for its clarity, astounding for its potential consequences, the Hypothesis took on enormous 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 resolution seems to hang tantalizingly just beyond our 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 the 1970s, it emerged that even the physics of the 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 "the veritable "great white whale" of mathematical research. Yet despite determined efforts by generations of 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 mathematical mystery that continues to challenge 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 elusive proof "and those who have been consumed by it.

Mathematical Structures of the Universe-Michal Eckstein 2014-10-09 This book contains a collection of essays on mathematical structures that serve to model the Universe. The contributions discuss such topics as the interplay between mathematics and physics, geometrical structures in physical models, and observational and conceptual aspects of cosmology. The reader can also contemplate the scientific method on the verge of its limits. [Subject: Physics, Mathematics, Cosmology, Natural Philosophy]

Finding our Place in the Universe-Hélène Courtois 2019-05-21 How a team of researchers, led by the author, discovered our home galaxy's location in the universe. You are here: on Earth, which is part of the solar system, which is in the Milky Way galaxy, which itself is within the extragalactic supercluster Laniakea. And how can we pinpoint our location so precisely? For twenty years, astrophysicist Hélène Courtois surfed the cosmos with international teams of researchers, working to map our local

universe. In this book, Courtois describes this quest and the discovery of our home supercluster. Courtois explains that Laniakea (which means "immense heaven" in Hawaiian) is the largest galaxy structure known to which we belong; it is huge, almost too large to comprehend—about five hundred million light-years in diameter. It contains about 100,000 large galaxies like our own, and a million smaller ones. Writing accessibly for nonspecialists, Courtois describes the visualization and analysis that allowed her team to map such large structures of the universe. She highlights the work of individual researchers, including portraits of several exceptional women astrophysicists—presenting another side of astronomy. Key ideas are highlighted in text insets; illustrations accompany the main text. The French edition of this book was named the Best Astronomy Book of 2017 by the astronomy magazine *Ciel et espace*. For this MIT Press English-language edition, Courtois has added descriptions of discoveries made after Laniakea: the cosmic velocity web and the Dipole and Cold Spot repellers. An engaging account of one of the most important discoveries in astrophysics in recent years, her story is a tribute to teamwork and international collaboration.

The Singular Universe and the Reality of Time-Roberto Mangabeira Unger 2014-12-08 Roberto Mangabeira Unger and Lee Smolin argue for a revolution in our cosmological ideas. Ideal for non-scientists, physicists and cosmologists.

The Penguin Dictionary of Curious and Interesting Numbers-David Wells 1997-09-04 Provides information on numbers and what makes particular ones noteworthy

Summary of Life 3.0: Being Human in the Age of Artificial ...

Trespassing on Einstein's Lawn-Amanda Geffer 2014-01-14 NAMED ONE OF THE BEST BOOKS OF THE YEAR BY KIRKUS REVIEWS In a memoir of family bonding and cutting-edge physics for readers of Brian Greene's *The Hidden Reality* and Jim Holt's *Why Does the World Exist?*, Amanda Geffer tells the story of how she conned her way into a career as a science journalist—and wound up hanging out, talking shop, and butting heads with the world's most brilliant minds. At a Chinese restaurant outside of Philadelphia, a father asks his fifteen-year-old daughter a deceptively simple question: "How would you define nothing?" With that, the girl who once tried to fail geometry as a conscientious objector starts reading up on general relativity and quantum mechanics, as she and her dad embark on a life-altering quest for the answers to the universe's greatest mysteries. Before Amanda Geffer became an accomplished science writer, she was a twenty-one-year-old magazine assistant willing to sneak her and her father, Warren, into a conference devoted to their physics hero, John Wheeler. Posing as journalists, Amanda and Warren met Wheeler, who offered them cryptic clues to the nature of reality: The universe is a self-excited circuit, he said. And, The boundary of a boundary is zero. Baffled, Amanda and Warren vowed to decode the phrases—and with them, the enigmas of existence. When we solve all that, they agreed, we'll write a book. *Trespassing on Einstein's Lawn* is that book, a memoir of the impassioned hunt that takes Amanda and her father from New York to London to Los Alamos. Along the way, they bump up against quirky science and even quirkier personalities, including Leonard Susskind, the former Bronx plumber who invented string theory; Ed Witten, the soft-spoken genius who coined the enigmatic M-theory; even Stephen Hawking. What they discover is extraordinary: the beginnings of a monumental paradigm shift in cosmology, from a single universe we all share to a splintered reality in which each observer has her own. Reality, the Geffers learn, is radically observer-dependent, far beyond anything of which Einstein or the founders of quantum mechanics ever dreamed—with shattering consequences for our understanding of the universe's origin. And somehow it all ties back to that conversation, to that Chinese restaurant, and to the true meaning of nothing. Throughout their journey, Amanda struggles to make sense of her own life—as her journalism career transforms from illusion to reality, as she searches for her voice as a writer, as she steps from a universe shared with her father to at last carve out one of her own. It's a paradigm shift you might call growing up. By turns hilarious, moving, irreverent, and profound, *Trespassing on Einstein's Lawn* weaves together story and science in remarkable ways. By the end, you will never look at the universe the same way again. Praise for *Trespassing on Einstein's Lawn* "Nothing quite prepared me for this book. Wow. Reading it, I alternated between depression—how could the rest of us science writers ever match this?—and exhilaration."—*Scientific American* "To Do: Read *Trespassing on Einstein's Lawn*. Reality doesn't have to bite."—*New York* "A zany superposition of genres . . . It's at once a coming-of-age chronicle and a father-daughter road trip to the far reaches of this universe and 10,500 others."—*The Philadelphia Inquirer*

Until the End of Time-Brian Greene 2020-02-18 Instant New York Times Bestseller A captivating exploration of deep time and humanity's search for purpose, from the world-renowned physicist and best-selling author of *The Elegant Universe*. "Few humans share Greene's mastery of both the latest cosmological science and English prose." —The New York Times (A Notable Book of 2020) *Until the End of Time* is Brian Greene's breathtaking new exploration of the cosmos and our quest to find meaning in the face of this vast expanse. Greene takes us on a journey from the big bang to the end of time, exploring how lasting structures formed, how life and mind emerged, and how we grapple with our existence through narrative, myth, religion, creative expression, science, the quest for truth, and a deep longing for the eternal. From particles to planets, consciousness to creativity, matter to meaning—Brian Greene allows us all to grasp and appreciate our fleeting but utterly exquisite moment in the cosmos.

History of Christianity-Paul Johnson 2012-03-27 First published in 1976, Paul Johnson's exceptional study of Christianity has been loved and widely hailed for its intensive research, writing, and magnitude—"a tour de force, one of the most ambitious surveys of the history of Christianity ever attempted and perhaps the most radical" (New York Review of Books). In a highly readable companion to books on faith and history, the scholar and author Johnson has illuminated the Christian world and its fascinating history in a way that no other has. Johnson takes off in the year AD 49 with his namesake the apostle Paul. Thus beginning an ambitious quest to paint the centuries since the founding of a little-known 'Jesus Sect', *A History of Christianity* explores to a great degree the evolution of the Western world. With an unbiased and overall optimistic tone, Johnson traces the fantastic scope of the consequent sects of Christianity and the people who followed them. Information drawn from extensive and varied sources from around the world makes this history as credible as it is reliable. Invaluable understanding of the framework of modern Christianity—and its trials and tribulations throughout history—has never before been contained in such a captivating work.

The Dream Universe-David Lindley 2020-03-17 A vivid and captivating narrative about how modern science broke free of ancient philosophy, and how theoretical physics is returning to its unscientific roots In the early seventeenth century Galileo broke free from the hold of ancient Platonic and Aristotelian philosophy. He drastically changed the framework through which we view the natural world when he asserted that we should base our theory of reality on what we can observe rather than pure thought. In the process, he invented what we would come to call science. This set the stage for all the breakthroughs that followed—from Kepler to Newton to Einstein. But in the early twentieth century when quantum physics, with its deeply complex mathematics, entered into the picture, something began to change. Many physicists began looking to the equations first and physical reality second. As we investigate realms further and further from what we can see and what we can test, we must look to elegant, aesthetically pleasing equations to develop our conception of what reality is. As a result, much of theoretical physics today is something more akin to the philosophy of Plato than the science to which the physicists are heirs. In *The Dream Universe*, Lindley asks what is science when it becomes completely untethered from measurable phenomena?

How People Learn-National Research Council 2000-08-11 First released in the Spring of 1999, *How People Learn* has been expanded to show how the theories and insights from the original book can translate into actions and practice, now making a real connection between classroom activities and learning behavior. This edition includes far-reaching suggestions for research that could increase the impact that classroom teaching has on actual learning. Like the original edition, this book offers exciting new research about the mind and the brain that provides answers to a number of compelling questions. When do infants begin to learn? How do experts learn and how is this different from non-experts? What can teachers and schools do—with curricula, classroom settings, and teaching methods—to help children learn most effectively? New evidence from many branches of science has significantly added to our understanding of what it means to know, from the neural processes that occur during learning to the influence of culture on what people see and absorb. *How People Learn* examines these findings and their implications for what we teach, how we teach it, and how we assess what our children learn. The book uses exemplary teaching to illustrate how approaches based on what we now know result in in-depth learning. This new knowledge calls into question concepts and practices firmly entrenched in our current education system. Topics include: How learning actually changes the physical structure of the brain. How existing knowledge affects what people notice and how they learn. What the thought processes of experts tell us about how to teach. The amazing

learning potential of infants. The relationship of classroom learning and everyday settings of community and workplace. Learning needs and opportunities for teachers. A realistic look at the role of technology in education.

The Big Picture-Sean Carroll 2016-05-10 The instant New York Times bestseller about humanity's place in the universe—and how we understand it. "Vivid...impressive....Splendidly informative."—The New York Times "Succeeds spectacularly."—Science "A tour de force."—Salon Already internationally acclaimed for his elegant, lucid writing on the most challenging notions in modern physics, Sean Carroll is emerging as one of the greatest humanist thinkers of his generation as he brings his extraordinary intellect to bear not only on Higgs bosons and extra dimensions but now also on our deepest personal questions: Where are we? Who are we? Are our emotions, our beliefs, and our hopes and dreams ultimately meaningless out there in the void? Do human purpose and meaning fit into a scientific worldview? In short chapters filled with intriguing historical anecdotes, personal asides, and rigorous exposition, readers learn the difference between how the world works at the quantum level, the cosmic level, and the human level—and then how each connects to the other. Carroll's presentation of the principles that have guided the scientific revolution from Darwin and Einstein to the origins of life, consciousness, and the universe is dazzlingly unique. Carroll shows how an avalanche of discoveries in the past few hundred years has changed our world and what really matters to us. Our lives are dwarfed like never before by the immensity of space and time, but they are redeemed by our capacity to comprehend it and give it meaning. *The Big Picture* is an unprecedented scientific worldview, a tour de force that will sit on shelves alongside the works of Stephen Hawking, Carl Sagan, Daniel Dennett, and E. O. Wilson for years to come.

Cosmological Koans: A Journey to the Heart of Physical Reality-Anthony Aguirre 2019-05-21 *Cosmological Koans* invites the reader into an intellectual adventure of the highest order. Through more than fifty Koans—pleasingly paradoxical vignettes following the ancient Zen tradition—leading physicist Anthony Aguirre takes the reader across the world from West to East, and through ideas spanning the age, breadth, and depth of the Universe. Using these beguiling Koans (Could there be a civilization on a mote of dust? How much of your fate have you made? Who cleans the universe?) and a flair for explaining complex science, Aguirre covers cosmic questions that scientific giants from Aristotle to Galileo to Heisenberg have grappled with, from the meaning of quantum theory and the nature of time to the origin of multiple universes. A playful and enlightening book, *Cosmological Koans* explores the strange hinterland between the deep structure of the physical world and our personal experience of it, giving readers what Einstein himself called "the most beautiful and deepest experience" anyone can have: a sense of the mysterious.

The Hidden Reality-Brian Greene 2011-06-09 In this exhilarating new book, Brian Greene explores our most current understanding of the universe, its deepest laws of nature, and our continuing quest to know more. *The Hidden Reality* reveals how major developments in different branches of fundamental theoretical physics—relativistic, quantum, cosmological, unified, computational—have all led us to consider one or another variety of parallel universe. In some, they are separated from us by enormous stretches of space or time, in others they're hovering millimetres away, in others still the very notion of their location proves to be a concept beyond our reach. Most extraordinarily, Greene shows how all of these parallel universe proposals emerge unbidden from the mathematics of theories developed to explain conventional data and observations of the cosmos. This is a life-changing book that gives us a true sense of the astounding possibilities of modern scientific investigation.

In Search of the Multiverse-John Gribbin 2010 We once had to abandon the idea of earth being at the centre of the universe. Now, we need to confront an even more profound possibility: the universe itself might just be one universe among many. *In Search of the Multiverse* takes us on an extraordinary journey, examining the most fundamental questions in science. What are the boundaries of our universe? Can there be different physical laws from the ones we know? Are there in fact other universes? Do we really live in a multiverse? This book is a search—the ultimate search—exploring the frontiers of reality. Ideas that were once science fiction have now come to dominate modern physics. And, as John Gribbin shows, there is increasing evidence that there really is more to the universe than we can see. Gribbin guides us through the different competing theories (there is more than one multiverse!) revealing what they have in common and what we can come to expect. He gives a brilliant tour of the current state of

cosmology. John Gribbin is our best, most accessible guide to the big questions of science. And there is no bigger question than our search for the multiverse.

The Cosmic Web-J. Richard Gott 2018-06-26 Semi-autobiographical discussion of astronomy and astronomers, and history of astronomy and cosmology.--

Philosophy of Physics-Tim Maudlin 2019-03-19 A sophisticated and original introduction to the philosophy of quantum mechanics from one of the world's leading philosophers of physics In this book, Tim Maudlin, one of the world's leading philosophers of physics, offers a sophisticated, original introduction to the philosophy of quantum mechanics. The briefest, clearest, and most refined account of his influential approach to the subject, the book will be invaluable to all students of philosophy and physics. Quantum mechanics holds a unique place in the history of physics. It has produced the most accurate predictions of any scientific theory, but, more astonishing, there has never been any agreement about what the theory implies about physical reality. Maudlin argues that the very term "quantum theory" is a misnomer. A proper physical theory should clearly describe what is there and what it does—yet standard textbooks present quantum mechanics as a predictive recipe in search of a physical theory. In contrast, Maudlin explores three proper theories that recover the quantum predictions: the indeterministic wavefunction collapse theory of Ghirardi, Rimini, and Weber; the deterministic particle theory of deBroglie and Bohm; and the conceptually challenging Many Worlds theory of Everett. Each offers a radically different proposal for the nature of physical reality, but Maudlin shows that none of them are what they are generally taken to be.

Infinitesimal: How a Dangerous Mathematical Theory Shaped the Modern World-Amir Alexander 2014-04-08 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.

The Quantum Astrologer's Handbook-Michael Brooks 2019-09-03 At once a biography, a history of science, an explanation of quantum theory, and an engrossing story, this volume explores the life and work Jerome Cardano, a 16th-century polymath from Milan who is the unacknowledged discoverer of the mathematical foundations of quantum physics.