

The Cosmic Landscape String Theory And The Illusion Of Intelligent Design

For readers of Sean Carroll, Brian Greene, Katie Mack, and anyone who wants to know what theoretical physicists actually do. This Way to the Universe is a celebration of the astounding, ongoing scientific investigations that have revealed the nature of reality its smallest, at its largest, and at the scale of our daily lives. The enigmas that Professor Michael Dine discusses are like landmarks on a fantastic journey to the edge of the universe. Asked where to find out about the Big Bang, Dark Matter, the Higgs boson particle—the long cutting edge of physics right now—Dine had no single book he could recommend. This is his accessible authoritative, and up-to-date answer. Comprehensible anyone with a high-school level education, with almost no equations, there is no better author to take you on this amazing odyssey. Dine is widely recognized as having made profound contributions to our understanding of matter, time, the Big Bang, and even what might have come before it. This Way to the Universe touches on many emotional, critical points in his extraordinary career while presenting mind-bending physics like his answer to the Dark Matter and Dark Energy mysteries as well as the ideas that explain why our universe consists of something rather than nothing.

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People assume String Theory can never be tested, but Dine intrepidly explores exactly how the theory might be tested experimentally, as well as the pitfalls of falling in love with math. This book reflects a lifetime pursuing the deepest mysteries of reality, by one of the most humble and warmly engaging voices you will ever read. The past decade has witnessed dramatic developments in the field of theoretical physics. This book is a comprehensive introduction to these recent developments. It contains a review of the Standard Model, covering non-perturbative topics, and a discussion of grand unified theories and magnetic monopoles. It introduces the basics of supersymmetry and its phenomenology, and includes dynamics, dynamical supersymmetry breaking, and electric-magnetic duality. The book then covers general relativity and the big bang theory, and the basic issues in inflationary cosmologies before discussing the spectra of known string theories and the features of their interactions. The book also includes brief introductions to technicolor, large extra dimensions, and the Randall-Sundrum theory of warped spaces. This will be of great interest to graduates and researchers in the fields of particle theory, string theory, astrophysics and cosmology. The book contains several problems, and password protected solutions will be available to lecturers at www.cambridge.org/9780521858410. Introduces the superstring theory that attempts to unify general relativity and quantum mechanics

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A master teacher presents the ultimate introduction to classical mechanics for people who are serious about learning physics "Beautifully clear explanations of famously 'difficult' things," -- Wall Street Journal If you ever regretted not taking physics in college -- or simply want to know how to think like a physicist -- this is the book for you. In this bestselling introduction to classical mechanics, physicist Leonard Susskind and hacker-scientist George Hrabovsky offer a first course in physics and associated math for the ardent amateur. Challenging, lucid, and concise, *The Theoretical Minimum* provides a tool kit for amateur scientists to learn physics at their own pace.

Astrophysicist George Smoot spent decades pursuing the origin of the cosmos, "the holy grail of science," a relentless hunt that led him from the rain forests of Brazil to the frozen wastes of Antarctica. In his search he struggled against time, the elements, and the forces of ignorance and bureaucratic insanity. Finally, after years of research, Smoot and his dedicated team of Berkeley researchers succeeded in proving the unprovable—uncovering, inarguably and for all time, the secrets of the creation of the universe. *Wrinkles in Time* describes this startling discovery that would usher in a new scientific age—and win Smoot the Nobel Prize in Physics.

The Rise of String Theory, the Fall of a Science, and what Comes Next

The Theoretical Minimum

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From Quark-gluon Plasma to Superstrings, Quantum Gravity and Beyond : Proceedings of the International School of Subnuclear Physics

A Fortunate Universe

Fashion, Faith, and Fantasy in the New Physics of the Universe

The Elegant Universe

How Beauty Leads Physics Astray

Physics World's 'Book of the Year' for 2016 An Entertaining and Enlightening Guide to the Who, What, and Why of String Theory, now also available in an updated reflowable electronic format compatible with mobile devices and e-readers. During the last 50 years, numerous physicists have tried to unravel the secrets of string theory. Yet why do these scientists work on a theory lacking experimental confirmation? Why String Theory? provides the answer, offering a highly readable and accessible panorama of the who, what, and why of this large aspect of modern theoretical physics. The author, a theoretical physics professor at the University of Oxford and a leading string theorist, explains what string theory is and where it originated. He describes how string theory fits into physics and why so many physicists and mathematicians find it appealing when working on topics from M-

theory to monsters and from cosmology to superconductors.

The Cosmic Landscape String Theory and the Illusion of Intelligent Design Back Bay Books
The essential beginner's guide to string theory
The Little Book of String Theory offers a short, accessible, and entertaining introduction to one of the most talked-about areas of physics today. String theory has been called the "theory of everything." It seeks to describe all the fundamental forces of nature. It encompasses gravity and quantum mechanics in one unifying theory. But it is unproven and fraught with controversy. After reading this book, you'll be able to draw your own conclusions about string theory. Steve Gubser begins by explaining Einstein's famous equation $E = mc^2$, quantum mechanics, and black holes. He then gives readers a crash course in string theory and the core ideas behind it. In plain English and with a minimum of mathematics, Gubser covers strings, branes, string dualities, extra dimensions, curved spacetime, quantum fluctuations, symmetry, and supersymmetry. He describes efforts to link string theory to experimental physics and uses analogies that nonscientists can understand. How does Chopin's Fantasie-

Impromptu relate to quantum mechanics? What would it be like to fall into a black hole? Why is dancing a waltz similar to contemplating a string duality? Find out in the pages of this book. The Little Book of String Theory is the essential, most up-to-date beginner's guide to this elegant, multidimensional field of physics.

Volume 2: Superstring Theory and Beyond, begins with an introduction to supersymmetric string theories and goes on to a broad presentation of the important advances of recent years. The book first introduces the type I, type II, and heterotic superstring theories and their interactions. It then goes on to present important recent discoveries about strongly coupled strings, beginning with a detailed treatment of D-branes and their dynamics, and covering string duality, M-theory, and black hole entropy, and discusses many classic results in conformal field theory. The final four chapters are concerned with four-dimensional string theories, and have two goals: to show how some of the simplest string models connect with previous ideas for unifying the Standard Model; and to collect many important and beautiful general results on world-sheet and spacetime symmetries.

Lee Smolin offers a new theory of the universe that is at once elegant, comprehensive, and radically different from anything proposed before. Smolin posits that a process of self organization like that of biological evolution shapes the universe, as it develops and eventually reproduces through black holes, each of which may result in a new big bang and a new universe. Natural selection may guide the appearance of the laws of physics, favoring those universes which best reproduce. The result would be a cosmology according to which life is a natural consequence of the fundamental principles on which the universe has been built, and a science that would give us a picture of the universe in which, as the author writes, "the occurrence of novelty, indeed the perpetual birth of novelty, can be understood." Smolin is one of the leading cosmologists at work today, and he writes with an expertise and force of argument that will command attention throughout the world of physics. But it is the humanity and sharp clarity of his prose that offers access for the layperson to the mind bending space at the forefront of today's physics.

The Failure of String Theory and the Search for Unity in Physical Law for Unity in Physical

Law

Modern String Theory Concepts from the Big Bang to Cosmic Structure

How Mathematics Unveils the Universe

String Theory For Dummies

String Cosmology

Three Lectures on Complexity and Black Holes

String Theory: Volume 2, Superstring Theory and Beyond

A Leading Figure in the Development of the New Cosmology Explains What It All Means Among his peers, Alex Vilenkin is regarded as one of the most imaginative and creative cosmologists of our time. His contributions to our current understanding of the universe include a number of novel ideas, two of which—eternal cosmic inflation and the quantum creation of the universe from nothing—have provided a scientific foundation for the possible existence of multiple universes. With this book—his first for the general reader—Vilenkin joins another select group: the handful of first-rank scientists who are equally adept at explaining their work to nonspecialists. With engaging, well-paced storytelling, a droll sense of humor, and a generous sprinkling of helpful cartoons, he conjures up a bizarre and fascinating new worldview that—to paraphrase Niels Bohr—just might be crazy enough to be true.

A theoretical physicist describes the evolution of

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modern-day string theory, the flaws in the attempt to formulate a "theory of everything" to explain all the forces and particles of nature and the origins of the universe, and their repercussions for physics.

#1 NEW YORK TIMES BEST SELLER • The epic story of the greatest quest in all of science—the holy grail of physics that would explain the creation of the universe—from renowned theoretical physicist and author of *The Future of the Mind* and *The Future of Humanity* When Newton discovered the law of gravity, he unified the rules governing the heavens and the Earth. Since then, physicists have been placing new forces into ever-grander theories. But perhaps the ultimate challenge is achieving a monumental synthesis of the two remaining theories—relativity and the quantum theory. This would be the crowning achievement of science, a profound merging of all the forces of nature into one beautiful, magnificent equation to unlock the deepest mysteries in science: What happened before the Big Bang? What lies on the other side of a black hole? Are there other universes and dimensions? Is time travel possible? Why are we here? Kaku also explains the intense controversy swirling around this theory, with Nobel laureates taking opposite sides on this vital question. It is a captivating, gripping story; what's at stake is nothing less than our conception of the universe. Written with Kaku's trademark enthusiasm and clarity, this epic and engaging journey is the story of *The God*

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Equation.

These three lectures cover a certain aspect of complexity and black holes, namely the relation to the second law of thermodynamics. The first lecture describes the meaning of quantum complexity, the analogy between entropy and complexity, and the second law of complexity. Lecture two reviews the connection between the second law of complexity and the interior of black holes. Prof. L. Susskind discusses how firewalls are related to periods of non-increasing complexity which typically only occur after an exponentially long time. The final lecture is about the thermodynamics of complexity, and “uncomplexity” as a resource for doing computational work. The author explains the remarkable power of “one clean qubit,” in both computational terms and in space-time terms. This book is intended for graduate students and researchers who want to take the first steps towards the mysteries of black holes and their complexity. Over the last forty years, scientists have uncovered evidence that if the Universe had been forged with even slightly different properties, life as we know it - and life as we can imagine it - would be impossible. Join us on a journey through how we understand the Universe, from its most basic particles and forces, to planets, stars and galaxies, and back through cosmic history to the birth of the cosmos. Conflicting notions about our place in the Universe are defined, defended and critiqued from scientific, philosophical and

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religious viewpoints. The authors' engaging and witty style addresses what fine-tuning might mean for the future of physics and the search for the ultimate laws of nature. Tackling difficult questions and providing thought-provoking answers, this volumes challenges us to consider our place in the cosmos, regardless of our initial convictions.

An Introduction to Black Holes, Information and the String Theory Revolution

The Trouble with Physics

String Theory and the Geometry of the Universe's Hidden Dimensions

Lost in Math

The Hidden Reality

String Theory Compactifications

Beyond the Standard Model

In this "provocative" book (New York Times), a contrarian physicist argues that her field's modern obsession with beauty has given us wonderful math but bad science. Whether pondering black holes or predicting discoveries at CERN, physicists believe the best theories are beautiful, natural, and elegant, and this standard separates popular theories from disposable ones. This is why, Sabine Hossenfelder argues, we have not seen a major breakthrough in the foundations of physics for more than four decades. The belief in beauty has become so dogmatic that it now conflicts with scientific objectivity: observation has been unable to confirm mindboggling theories, like supersymmetry or grand unification, invented by physicists based on aesthetic criteria. Worse, these "too good to not be true" theories are actually untestable and they have left the field in a cul-de-sac. To escape,

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physicists must rethink their methods. Only by embracing reality as it is can science discover the truth.

A prize-winning popular science writer uses mathematical modeling to explain the cosmos. In *Calculating the Cosmos*, Ian Stewart presents an exhilarating guide to the cosmos, from our solar system to the entire universe. He describes the architecture of space and time, dark matter and dark energy, how galaxies form, why stars implode, how everything began, and how it's all going to end. He considers parallel universes, the fine-tuning of the cosmos for life, what forms extraterrestrial life might take, and the likelihood of life on Earth being snuffed out by an asteroid. Beginning with the Babylonian integration of mathematics into the study of astronomy and cosmology, Stewart traces the evolution of our understanding of the cosmos: How Kepler's laws of planetary motion led Newton to formulate his theory of gravity. How, two centuries later, tiny irregularities in the motion of Mars inspired Einstein to devise his general theory of relativity. How, eighty years ago, the discovery that the universe is expanding led to the development of the Big Bang theory of its origins. How single-point origin and expansion led cosmologists to theorize new components of the universe, such as inflation, dark matter, and dark energy. But does inflation explain the structure of today's universe? Does dark matter actually exist? Could a scientific revolution that will challenge the long-held scientific orthodoxy and once again transform our understanding of the universe be on the way? In an exciting and engaging style, *Calculating the Cosmos* is a mathematical quest through the intricate realms of astronomy and cosmology.

From August 29 to September 7, 2006, a large group of distinguished lecturers and young physicists coming from various countries around the world met in Erice, Italy, at the Ettore

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Majorana Foundation and Centre for Scientific Culture (EMFCSC) for the 44th course of the International School of Subnuclear Physics: ?The Logic of Nature, Complexity and New Physics: From Quark-Gluon Plasma to Superstrings, Quantum Gravity and Beyond?. This book is a collection of lectures given during the course, covering the most recent advances in theoretical physics and the latest results from current experimental facilities. Following one of the aims of the School, which is to encourage and promote young physicists to achieve recognition at an international level, the students who have distinguished themselves for their excellence in research have been given the opportunity to publish their presentations in this volume.

- A unique exposition of the foundations of the quantum theory of black holes including the impact of string theory, the idea of black hole complementarity and the holographic principle; Aims to educate the physicist or student of physics who is not an expert on string theory, on the revolution that has grown out of black hole physics and string theory

String theory is one of the most exciting and challenging areas of modern theoretical physics. This book guides the reader from the basics of string theory to recent developments. It introduces the basics of perturbative string theory, world-sheet supersymmetry, space-time supersymmetry, conformal field theory and the heterotic string, before describing modern developments, including D-branes, string dualities and M-theory. It then covers string geometry and flux compactifications, applications to cosmology and particle physics, black holes in string theory and M-theory, and the microscopic origin of black-hole entropy. It concludes with Matrix theory, the AdS/CFT duality and its generalizations. This book is ideal for graduate students and

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researchers in modern string theory, and will make an excellent textbook for a one-year course on string theory. It contains over 120 exercises with solutions, and over 200 homework problems with solutions available on a password protected website for lecturers at www.cambridge.org/9780521860697.

Supersymmetry and String Theory

This Way to the Universe

A Theoretical Physicist's Journey to the Edge of Reality

Not Even Wrong

The Logic of Nature, Complexity and New Physics

The Life of the Cosmos

What You Need to Know to Start Doing Physics

The bestselling author of *The Elegant Universe* and *The Fabric of the Cosmos* tackles perhaps the most mind-bending question in modern physics and cosmology: Is our universe the only universe? There was a time when "universe" meant all there is. Everything. Yet, a number of theories are converging on the possibility that our universe may be but one among many parallel universes populating a vast multiverse. Here, Briane Greene, one of our foremost physicists and science writers, takes us on a breathtaking journey to a multiverse comprising an endless series of big bangs, a multiverse with duplicates of every one of us, a multiverse populated by vast sheets of spacetime, a multiverse in which all we consider real are holographic illusions, and

even a multiverse made purely of math--and reveals the reality hidden within each. Using his trademark wit and precision, Greene presents a thrilling survey of cutting-edge physics and confronts the inevitable question: How can fundamental science progress if great swaths of reality lie beyond our reach? The Hidden Reality is a remarkable adventure through a world more vast and strange than anything we could have imagined.

In this book William A. Dembski brilliantly argues that intelligent design provides a crucial link between science and theology. This is a pivotal work from a thinker whom Phillip Johnson calls "one of the most important of the 'design' theorists."

String theory says we live in a ten-dimensional universe, but that only four are accessible to our everyday senses. According to theorists, the missing six are curled up in bizarre structures known as Calabi-Yau manifolds. In The Shape of Inner Space, Shing-Tung Yau, the man who mathematically proved that these manifolds exist, argues that not only is geometry fundamental to string theory, it is also fundamental to the very nature of our universe. Time and again, where Yau has gone, physics has followed. Now for the first time, readers will follow Yau's

penetrating thinking on where we've been, and where mathematics will take us next. A fascinating exploration of a world we are only just beginning to grasp, The Shape of Inner Space will change the way we consider the universe on both its grandest and smallest scales.

In his first book ever, the father of string theory reinvents the world's concept of the known universe and man's unique place within it. Line drawings.

Physicists argue from different perspectives for and against the idea of the existence of multiple universes.

My Battle with Stephen Hawking to Make the World Safe for Quantum Mechanics

Theory and Applications

Witness to the Birth of the Universe

Universe Or Multiverse?

The Bridge Between Science Theology

Quantum Theory, Groups and

Representations

The Cosmic Landscape

String theory has played a highly influential role in theoretical physics for nearly three decades and has substantially altered our view of the elementary building principles of the Universe. However, the theory remains empirically unconfirmed, and is expected to remain so for the foreseeable future. So why do string theorists have

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such a strong belief in their theory? This book explores this question, offering a novel insight into the nature of theory assessment itself. Dawid approaches the topic from a unique position, having extensive experience in both philosophy and high-energy physics. He argues that string theory is just the most conspicuous example of a number of theories in high-energy physics where non-empirical theory assessment has an important part to play. Aimed at physicists and philosophers of science, the book does not use mathematical formalism and explains most technical terms.

A study of one of the fundamental concept of quantum physics examines the strange correlation between two separated particles, entitled "entanglement" by physicist John Bell, drawing on the work of leading physicists to explain the phenomenon.

This text systematically presents the basics of quantum mechanics, emphasizing the role of Lie groups, Lie algebras, and their unitary representations. The mathematical structure of the subject is brought to the fore, intentionally avoiding significant overlap with material from standard physics courses in quantum mechanics and quantum field theory. The level of presentation is attractive to mathematics students looking to learn about both quantum mechanics and representation theory, while also appealing to physics students who would like to know more about the mathematics underlying the subject. This text showcases the numerous differences between typical mathematical and physical treatments of

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the subject. The latter portions of the book focus on central mathematical objects that occur in the Standard Model of particle physics, underlining the deep and intimate connections between mathematics and the physical world. While an elementary physics course of some kind would be helpful to the reader, no specific background in physics is assumed, making this book accessible to students with a grounding in multivariable calculus and linear algebra. Many exercises are provided to develop the reader's understanding of and facility in quantum-theoretical concepts and calculations.

When does physics depart the realm of testable hypothesis and come to resemble theology? Peter Woit argues that string theory isn't just going in the wrong direction, it's not even science. *Not Even Wrong* shows that what many physicists call superstring "theory" is not a theory at all. It makes no predictions, not even wrong ones, and this very lack of falsifiability is what has allowed the subject to survive and flourish. Peter Woit explains why the mathematical conditions for progress in physics are entirely absent from superstring theory today, offering the other side of the story.

A clear, plain-English guide to this complex scientific theory String theory is the hottest topic in physics right now, with books on the subject (pro and con) flying out of the stores. *String Theory For Dummies* offers an accessible introduction to this highly mathematical "theory of everything," which posits ten or more dimensions in an attempt to explain the basic nature of matter and energy.

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Written for both students and people interested in science, this guide explains concepts, discusses the string theory's hypotheses and predictions, and presents the math in an approachable manner. It features in-depth examples and an easy-to-understand style so that readers can understand this controversial, cutting-edge theory.

Inflation and String Theory

The Black Hole War

The Little Book of String Theory

The Search for Other Universes

A First Course in String Theory

Flat and Curved Space-times

Proceedings of the 23rd Solvay Conference on Physics,
Brussels, Belgium, 1-3 December, 2005

Inflationary cosmology has been developed over the last twenty years to remedy serious shortcomings in the standard hot big bang model of the universe. This textbook, first published in 2005, explains the basis of modern cosmology and shows where the theoretical results come from. The book is divided into two parts: first deals with the homogeneous and isotropic model of the Universe, the second part discusses how inhomogeneities can explain its structure. Established material such as the inflation and quantum cosmological perturbation are presented in great detail, however the reader is brought to the frontiers of current cosmological research by the discussion of more speculative ideas. An ideal textbook for both advanced students of physics and astrophysics, all of the necessary background material

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included in every chapter and no prior knowledge of general relativity and quantum field theory is assumed. Many people know that Einstein invented the theory of relativity, but only few have more than a superficial idea of its content. This book aims to explain the basic features of relativity in detail, emphasising the geometrical aspects by using a large number of diagrams, and assuming no knowledge of higher level mathematics.

One of the world's leading physicists questions some of the most fashionable ideas in physics today, including string theory. What can fashionable ideas, blind faith, or pure fantasy possibly have to do with the scientific quest to understand the universe? Surely, theoretical physicists are immune to mere trends, dogmatic beliefs, or flights of fancy? In fact, acclaimed physicist and bestselling author Roger Penrose argues that researchers working at the extreme frontiers of physics are just as susceptible to these forces as anyone else. In this provocative book, he argues that fashion, faith, and fantasy, while sometimes productive and even essential in physics, may be leading today's researchers astray in three of the field's most important areas—string theory, quantum mechanics, and cosmology. Arguing that string theory has veered away from physical reality by positing six extra hidden dimensions, Penrose cautions that the fashionable nature of a theory can cloud our judgment of its plausibility. In the case of quantum mechanics, its stunning success in explaining the atomic universe has led to an uncritical faith that it must also apply to reasonably massive objects.

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and Penrose responds by suggesting possible changes quantum theory. Turning to cosmology, he argues that most of the current fantastical ideas about the origins the universe cannot be true, but that an even wilder reality may lie behind them. Finally, Penrose describes how fashion, faith, and fantasy have ironically also shaped his own work, from twistor theory, a possible alternative to string theory that is beginning to acquire a fashionable status, to "conformal cyclic cosmology," an idea so fantastic that it could be called "conformal crazy cosmology." The result is an important critique of some of the most significant developments in physics today from one of its most eminent figures.

This relatively new field applies equations from string theory to solve the questions of early cosmology, since the standard picture of our universe emerging from a 'big bang' leaves many fundamental issues unanswered. String theory, on the other hand, postulates that fundamental ingredients of nature are not zero-dimensional point particles but tiny one-dimensional filaments. This theory harmoniously unites quantum mechanics and general relativity -- the previously known laws of the small and the large -- which are otherwise incompatible. The field of string cosmology has matured considerably over the past few years, attracting many new adherents. Due to the multidisciplinary nature of the topic, it is difficult for practitioners to be conversant with all the many different aspects. This book thus fills a huge gap by bringing together all the different strains of research into one

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single volume. The resulting collection of selected articles presents the latest, ongoing results from renowned experts currently working in the field. From the contents: * Introduction to Cosmology and String Theory * String Inflation: Brane Inflation and Inflation from Moduli * Cosmic Superstrings * The CMB as a Possible Probe of String Theory * String Gas Cosmology * Gauge-gravity Duality and String Cosmology * Heterotic M-theory and C A welcome addition to the literature for graduate students, students in astronomy, astronomers, mathematicians and theoretical physicists.

What happens when something is sucked into a black hole? Does it disappear? Three decades ago, a young physicist named Stephen Hawking claimed it did-and in doing so put at risk everything we know about physics the fundamental laws of the universe. Most scientists didn't recognize the import of Hawking's claims, but Leonard Susskind and Gerard t'Hooft realized the threat and responded with a counterattack that changed the course of physics. THE BLACK HOLE WAR is the thrilling story of their united effort to reconcile Hawking's revolutionary theories of black holes with their own sense of reality-effort that would eventually result in Hawking admitting he was wrong, paying up, and Susskind and t'Hooft realizing that our world is a hologram projected from the outer boundaries of space. A brilliant book about modern physics, quantum mechanics, the fate of stars and the deep mysteries of black holes, Leonard Susskind's account of the Black Hole War is mind-bending and

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exhilarating reading.

When Quantum Physics was Reborn

The Age of Entanglement

Physical Foundations of Cosmology

The Quantum Structure of Space and Time

The Shape of Inner Space

Why String Theory?

Many Worlds in One

The third volume in the bestselling physics series cracks open Einstein's special relativity and field theory. Physicist Leonard Susskind and data engineer Art Friedman are back. This time, they introduce readers to Einstein's special relativity and Maxwell's classical field theory. Using their typical brand of real math, enlightening drawings, and humor, Susskind and Friedman walk us through the complexities of waves, forces, and particles by exploring special relativity and electromagnetism. It's a must-read for both devotees of the series and any armchair physicist who wants to improve their knowledge of physics' deepest truths. The past two decades have seen transformative advances in cosmology and string theory. Observations of the cosmic microwave background have revealed strong evidence for inflationary expansion in the very early universe, while new insights about compactifications of string theory have led to a deeper understanding of inflation in a framework that unifies quantum mechanics and general relativity. Written by two of the leading researchers in the field, this complete and accessible volume provides a modern treatment of inflationary cosmology and its connections to string theory and elementary particle theory. After an up-to-date

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experimental summary, the authors present the foundations of effective field theory, string theory, and string compactifications, setting the stage for a detailed examination of models of inflation in string theory. Three appendices contain background material in geometry and cosmological perturbation theory, making this a self-contained resource for graduate students and researchers in string theory, cosmology, and related fields.

Ever since 1911, the Solvay Conferences have shaped modern physics. The 23rd edition, chaired by 2004 Nobel Laureate David Gross, did not break with that tradition. It gathered most of the leading figures working on the central problem of reconciling Einstein's theory of gravity with quantum mechanics. These proceedings give a broad overview with unique insight into the most fundamental issues raised by this challenge for 21st century physics, by distinguished renowned scientists. The contributions cover: the status of quantum mechanics, spacetime singularities and breakdown of classical space and time, mathematical structures underlying the most promising attempts under current development, spacetime as an emergent concept, as well as cosmology and the cosmological constant puzzle. A historical overview of the Solvay conferences by historian of sciences Peter Galison opens the volume. In the Solvay tradition, the volume also includes the discussions among the participants ? many of which were quite lively and illustrate dramatically divergent points of view ? carefully edited and reproduced in full.

The lectures in this book provide graduate students and non-specialist researchers with a concise introduction to the concepts and formalism required to reduce the ten-

dimensional string theories to the observable four-dimensional space-time - a procedure called string compactification. The text starts with a very brief introduction to string theory, first working out its massless spectrum and showing how the condition on the number of dimensions arises. It then dwells on the different possible internal manifolds, from the simplest to the most relevant phenomenologically, thereby showing that the most elegant description is through an extension of ordinary Riemannian geometry termed generalized geometry, which was first introduced by Hitchin. Last but not least, the authors review open problems in string phenomenology, such as the embedding of the Standard Model and obtaining de Sitter solutions.

This book focuses on information-geometric manifolds of structured data and models and related applied mathematics. It features new and fruitful interactions between several branches of science: Advanced Signal/Image/Video Processing, Complex Data Modeling and Analysis, Statistics on Manifolds, Topology/Machine/Deep Learning and Artificial Intelligence. The selection of applications makes the book a substantial information source, not only for academic scientist but it is also highly relevant for industry. The book project was initiated following discussions at the international conference GSI'2019 – Geometric Science of Information that was held at ENAC, Toulouse (France).

A Modern Introduction

String Theory and the Scientific Method

The God Equation

An Introduction

Calculating the Cosmos

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The Quest for a Theory of Everything

String theory made understandable. Barton Zwiebach is once again faithful to his goal of making string theory accessible to undergraduates. He presents the main concepts of string theory in a concrete and physical way to develop intuition before formalism, often through simplified and illustrative examples. Complete and thorough in its coverage, this new edition now includes AdS/CFT correspondence and introduces superstrings. It is perfectly suited to introductory courses in string theory for students with a background in mathematics and physics. New sections cover strings on orbifolds, cosmic strings, moduli stabilization, and the string theory landscape. Now with almost 300 problems and exercises, with password-protected solutions for instructors at www.cambridge.org/zwiebach.

Parallel Universes and the Deep Laws of the Cosmos

Superstrings, Hidden Dimensions, and the Quest for the Ultimate Theory

Wrinkles in Time

Progress in Information Geometry

String Theory and the Illusion of Intelligent Design

The Holographic Universe

Intelligent Design