String Theory And Fundamental Interactions Gabriele Veneziano And Theoretical Physics Historical And Contemporary Perspectives Lecture Notes In Physics

This memorial volume on the work of Wolfgang Kummer brings together articles devoted to the history of high energy physics with detailed coverage on the scientific concepts and scientific institutions, in particular CERN OCo and the underlying physics involved. Covering recent advances and developments as well as giving a reminiscent overview in two rapidly evolving fields of high energy/particle physics, and gravitational physics, the commemorative volume contains more than 20 original invited paper contributions OCo which will appear for the first time in print OCo from eminent and renowned physicists who interacted and collaborated with Wolfgang Kummer, including Physics Nobel Laureate Jack Steinberger. Wolfgang Kummer was president of the CERN council from 1985 to 1987, among his numerous eminent academic and administrative positions which he held during his illustrious career. This volume also aims to demonstrate and highlight Wolfgang Kummer''s significant contribution to the foundational work in gauge field theory, particle physics, and quantum gravity, and the tremendous impact leading to cutting-edge findings and advances at LHC. Sample Chapter(s). Foreword (155 KB). Chapter 1: Noncovariant Gauges at Zero and Nonzero Temperature (215 KB). Contents: Gauge Field Theory and Particle Physics: Noncovariant Gauges at Zero and Nonzero Temperature (P V Landshoff); Non-Relativistic Bound States: The Long Way Back from the BetheOCoSalpeter to the SchrAdinger Equation (A Vairo); Distended/Diminished Topologically Massive Electrodynamics (S Deser); Dynamical Spin (P G O Freund); Quantum Corrections to Solitons and BPS Saturation (A Rebhan et al.); Gauging Noncommutative Theories (H Grosse & M Wohlgenannt); Topological Phases and Contextuality Effects in Neutron Quantum Optics (H Rauch); First Class Constrained Systems and Twisting of Courant Algebroids by a Closed 4-Form (M Hansen & T Strobl); Some Local and Global Aspects of the Gauge Fixing in YangOCoMills-Theories (D N Blaschke et al.); Frozen Ghosts in Thermal Gauge Field Theory (P V Landshoff & A Rebhan); Classical and Quantum Gravity: Wolfgang Kummer and the Vienna School of Dilaton (Super-)Gravity (L Bergamin & R Meyer); Order and Chaos in Two Dimensional Gravity (R B Mann); 2-D Midisuperspace Models for Quantum Black Holes (J Gegenberg & G Kunstatter); Global Solutions in Gravity. Euclidean Signature (M O Katanaev); Thoughts on the Cosmological Principle (D J Schwarz); When Time Emerges (C Faustmann et al.); Towards Noncommutative Gravity (D V Vassilevich); Superembedding Approach to Superstring in AdS 5 X S 5 Superspace (I A Bandos); Heterotic (0,2) Gepner Models and Related Geometries (M Kreuzer); Canonical Analysis of Cosmological Topologically Massive Gravity at the Chiral Point (D Grumiller et al.); Wolfgang Kummer and the Physics Community: Wolfgang Kummer at CERN (H Schopper); Wolfgang Kummer and the Little Lost Lane Boy (K Lane); Mitigation of Fossil Fuel Consumption and Global Warming by Thermal Solar Electric Power Production in the World''s Deserts (J Steinberger); (My) Life with Wolfgang Kummer (M Schweda); Schubert in Stony Brook and Kinks in Vienna (P van Nieuwenhuizen). Readership: Scientists, researchers, graduates and undergraduates interested in high energy, particle or gravitational physics."

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 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.

String theory is the candidate for the unification of all fundamental interactions including gravity. In the past few years this active field of research has developed very rapidly and in several different directions. The aim of the conference is to give an overview of the status of the art in string theory through the contributions of the major experts in this field. The main topics include: string unification and effective Lagrangians, N=2 string theories, 2-d quantum gravity, stringy black holes, topological

field theory, conformal field theories, strings and quantum field theory.

New fundamental forces of Nature? New forms of "dark'' energy? Signals from epochs preceding the Big Bang? Is our space-time unique? Only a joint study of the three topics examined in this book - gravity, strings and particles - may provide answers to these questions. Such a study may also provide the key to solving one of the most fascinating mysteries of modern science, namely: Besides time and the three spatial dimensions, how many other dimensions exist in our universe? The book is primarily addressed to readers who do not necessarily have a specific background in physics but are nevertheless interested in discovering the originality and the possible implications of some of the amazing ideas in modern theoretical physics. The emphasis is on conveying ideas rather than explaining formulas, focusing not on what is known but -- mainly -- on what is still unknown. Many parts of the book are devoted to fundamental theoretical models and results which are potentially highly relevant for a deeper understanding of Nature, but are still waiting to be confirmed (or disproved) by experiments. From this point of view, the material of this book may also be of interest to professional physicists, whether or not they work in the field of fundamental interactions.

The Fundamental Interaction

The Scientific Basis for a Rational World

Proceedings of the Second Yukawa Memorial Symposium, Nishinomiya, Japan, October 23-24, 1987

String Theory, Quantum Gravity, and the Unification of the Fundamental Interactions

String Theory in a Nutshell

A Memorial Volume for Wolfgang Kummer

The essential introduction to modern string theory—now fully expanded and revised String Theory in a Nutshell is the definitive introduction to modern string theory. Written by one of the world's leading authorities on the subject, this concise and accessible book starts with basic definitions and guides readers from classic topics to the most exciting frontiers of research today. It covers perturbative string theory, the unity of string interactions, black holes and their microscopic entropy, the AdS/CFT correspondence and its applications, matrix model tools for string theory, and more. It also includes 600 exercises and serves as a self-contained guide to the literature. This fully updated edition features an entirely new chapter on flux compactifications in string theory, and the chapter on AdS/CFT has been substantially expanded by adding many applications to diverse topics. In addition, the discussion of conformal field theory has been extensively revised to make it more student-friendly. The essential one-volume reference for students and researchers in theoretical high-energy physics Now fully expanded and revised Provides expanded coverage of AdS/CFT and its applications, namely the holographic renormalization group, holographic theories for Yang-Mills and QCD, nonequilibrium thermal physics, finite density physics, and entanglement entropy Ideal for mathematicians and physicists specializing in theoretical cosmology, QCD, and novel approaches to condensed matter systems An online illustration package is available to professors

The Lake Louise Winter Institute is held annually to explore recent trends in physics. The proceedings contain pedagogical and review lectures by invited experts and contributed presentations by participants. Contents: Physics at TESLA (G A Blair)Searches at HERA (N Delerue)Particle Production and Multiplicity in Heavy Ion Collisions at PHENIX (L Ewell)Two Photon Physics at LEP (D Haas)Higgs Searches with the DELPHI Detector (J Hansen)Noncummutative Field Theories and Spontaneous Symmetry Breaking (K Kaminsky)Electromagnetic Interactions in Strong Magnetic Fields (D Leahy)Recent Results from K2K (T Nakaya)Doubly Resonant Z Pair Production with DELPHI (J Rehn)Charmless Hadronic B Decays at BABAR (T Schietinger)ATLAS Physics Potential (J Sjolin)An Improved Measurement of the Anomalous Magnetic Moment of the Positive Muon (A Trofimov)and other papers Readership: High energy physicists. Keywords:Fundamental Interactions

String theories seem to have created a breakthrough in theoretical physics. At long last a unfied theory of all the fundamental interactions, including gravity, looks possible. This, according to theorist Stephen Hawking, will mark the end of theoretical physics as we have known it, since we will then have a single consistent theory within which to explain all natural phenomena from elementary particles to galactic superclusters. Strings themselves are extremely tiny entities, smaller than the Planck scale, which form loops whose vibrational harmonics can be used to model all the standard elementary particles. Of course the mathematical complexities of the theory are daunting, and physicists are still at a very early stage in understanding how strings and their theoretical cousins superstrings can be used. This proceedings volume gives an overview of the intense recent work in the field and reports latest developments.

This book has been prepared to celebrate the 65th birthday of Gabriele Veneziano and his retirement from CERN in September 2007. This reti- ment certainly will not mark the end of his extraordinary scienti?c career (in particular, he will remain on the permanent sta? of the Coll` ege de France in Paris), but we believe that this important step deserves a special celebration, and an appropriate recognition of his monumental contribution to physics. Our initial idea of preparing a volume of Selected papers of Professor Gabriele Veneziano, possibly with some added commentary, was dismissed when we realized that this format of book, very popular in former times, has become redundant today because of the full "digitalization" of all important physical journals, and their availability online in the electronic archives. We have thus preferred an alternative (and unconventional, but probably more e?ective) form of celebrating Gabriele's birthday: a collection of new papers written by his main collaborators and friends on the various aspects of th- retical physics that have been the object of his research work, during his long and fruitful career.

A First Course in String Theory

A Modern Introduction

A First Introduction to Cosmology and the Fundamental Interactions

Proceedings of Nobel Symposium 67, Marstrand, Sweden, June 2-7, 1986
Testing General Relativity in Fermilab
String Theory and M-Theory

In physics, the fundamental forces, are the interactions that do not appear to be reducible to more basic interactions. There are four conventionally accepted fundamental interactions-gravitational, electromagnetic, strong, and weak. Each one is described mathematically as a field. The gravitational force is modelled as a continuous classical field. The other three, part of the Standard Model of particle physics, are described as discrete quantum fields, and their interactions are each carried by a quantum, an elementary particle. The strong and weak interactions have short ranges, producing forces at minuscule, subatomic distances; these forces govern nuclear interactions. The strong interaction, which is carried by the gluon particle, is responsible for the binding of quarks together to form hadrons, such as protons and neutrons. As a residual effect, it creates the nuclear force that binds the latter particles to form atomic nuclei. The weak interaction, which is carried by the W and Z particles, also acts on the nucleus, mediating radioactive decay. The other two, electromagnetism and gravity, produce significant forces at macroscopic scales where the effects can be seen directly in everyday life. The electromagnetic force, carried by the photon, creates electric and magnetic fields, which are responsible for chemical bonding and are used in electrical technology. Electromagnetic forces tend to cancel each other out when large collections of objects are considered, so over the largest distances (on the scale of planets and galaxies), gravity tends to be the dominant force. All four fundamental forces are believed to be related, and to unite into a single force at high energies on a minuscule scale, the Planck scale, but particle accelerators cannot produce the enormous energies required to experimentally probe this. A goal of theoretical physicists working beyond the Standard Model is to quantize the gravitational field, yielding a theory of quantum gravity (QG) which would unite gravity in a common theoretical framework with the other three forces. Other theorists seek to unite the electroweak and strong fields within a Grand Unified Theory (GUT). Some theories, notably string theory, seek both QG and GUT within one framework, unifying all four fundamental interactions along with mass generation within a theory of everything (ToE). A few researchers have interpreted various anomalous observations in physics as evidence for a fifth force, but this is not widely accepted. This book is designed to be a state of the art, superb academic reference work and provide an overview of the topic and give the reader a structured knowledge to familiarize yourself with the topic at the most affordable price possible. The accuracy and knowledge is of an international viewpoint as the edited articles represent the inputs of many knowledgeable individuals and some of the most current knowledge on the topic, based on the date of publication.

A meeting was held at the Physics Centre in Bad Honnef from Feb. 16-20, 1987 on the subject "The Fundamental Interaction: Geometrical Trends". This meeting was in the series of Physics Schools organized by the German Physical Society. The participants were mainly younger scientists and graduate students: physicists, mathematicians and astronomers from the Federal Republic of Germany; there were also participants from Austria, the Netherlands and Switzerland. The purpose of the meeting was to introduce the participants to modern methods of mathematics and field theory which are increasingly being used in current elementary particle research. An outstanding feature of the school was the fact that each lecturer really made an effort to present his material at an introductory level, which could be followed by people with the usual degree level qualifications and which, nevertheless, then led up to the level of contemporary specialized literature. We hope that the published volume will make these lectures, which taken together give a unified overview of the recent developments leading up to the current world-view in modern theoretical physics, available to a wider audience. We wish to thank the lecturers, who besides the formal lectures devoted their time to discussions with the participants throughout the duration of the School. We are also grateful to the staff of the Physics Centre for their organizational assistance, and to the participants, whose active interest made the meeting a success. The entire manuscript was efficiently typed by Manfred Krafczyk at the University of Dortmund.

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.

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 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.

Gravity, Strings and Particles

The Birth of String Theory

String theory, quantum gravity and the unification of the fundamental interactions

FUNDAMENTALS OF PHYSICS - Volume II

Topological Quantum Field Theory and Four Manifolds

This is the second edition of a well-received book that is a modern, self-contained introduction to the theory of gravitational interactions. The new edition includes more details on gravitational waves of cosmological origin, the so-called brane world scenario, and gravitational time-delay effects.The first part of the book follows the traditional presentation of general relativity as a geometric theory of the macroscopic gravitational field, while the second, more advanced part discusses the deep analogies (and differences) between a geometric theory of gravity and the gauge theories of the other fundamental interactions. This fills a gap within the traditional approach to general relativity which usually leaves students puzzled about the role of gravity. The required notions of differential geometry are reduced to the minimum, allowing room for aspects of gravitational physics of current phenomenological and theoretical interest, such as the properties of gravitational waves, the gravitational interactions of spinors, and the supersymmetric and higher-dimensional generalization of the Einstein equations. This textbook is primarily intended for students pursuing a theoretical or astroparticle curriculum but is also relevant for PhD students and young researchers.

Fundamentals of Physics is a component of Encyclopedia of Physical Sciences, Engineering and Technology Resources in the global Encyclopedia of Life Support Systems (EOLSS), which is an integrated compendium of twenty Encyclopedias. The Theme on Fundamentals of Physics provides an overview of the modern areas in physics, most of which had been crystallized in the 20th century, is given. The Theme on Fundamentals of Physics deals, in three volumes and cover several topics, with a myriad of issues of great relevance to our world such as: Historical Review of Elementary Concepts in Physics; Laws of Physical Systems; Particles and Fields; Quantum Systems; Order and Disorder in Nature; Topical Review: Nuclear Processes, which are then expanded into multiple subtopics, each as a chapter. These three volumes are aimed at the following five major target audiences: University and College Students, Educators, Professional Practitioners, Research Personnel and Policy Analysts, Managers, and Decision Makers, NGOs and GOs.

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.

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.

Not Even Wrong

Topics In Quantum Field Theory: Modern Methods In Fundamental Physics

Tying the Forces Together

Strings and Gravity

The Little Book of String Theory

Quantum String Theory

La théorie de la gravitation d'Einstein ("relativité générale") est un des piliers de la physique moderne. Cette théorie a connu des développements spectaculaires ces dernières années, aussi bien sur

le plan expérimental que sur le plan théorique. En particulier, la théorie des cordes, née il y a une quinzaine d'années, offre des perspectives remarquables d'unification de la force gravitationnelle aux autres forces fondamentales - réalisant ainsi un des vieux rêves d'Einstein. Cet ouvrage rassemble les contributions des experts mondiaux du domaine ayant participé au colloque Francqui qui s'est tenu sur ce thème à Bruxelles du 19 au 21 octobre 2001. Einstein theory of gravity is one of the pillars of modern physics. In the last years, this theory has undergone dramatic developments, both on the experimental and theoretical sides. In particular, string theory, which started in the last quarter of the XXth century, offers remarkable prospects to unify all the fundamental interactions - realizing thereby one of the Einstein's dreams. This book contains the contributions of the world leaders in the field who took part in the "Francqui conference" held on this theme in Brussels in October 2001.

A physicist uses science and philosophy to answer the ancient, unsolvable question: why does the universe exist?

This book constitutes the proceedings of a meeting which brought together contributors from the four European networks in the area of the theory of fundamental interactions. While each of these networks overlaps strongly with all the others, this coming together gives the proceedings a greater than usual breadth of subjects nevertheless. The wide range of topics in quantum field theory covered includes Hamiltonian and semiclassical methods, critical phenomena and various aspects of classical and quantum gravity including also a study in the detection of gravitational radiation. This, together with the leading item on the recent history of the subject, gives an overall perspective of the many new research directions in this area.

Unravel the secrets of the universe and untangle cutting-edge physics Yes, you actually can understand quantum physics! String Theory For Dummies is a beginner’s guide, and we make it fun to find out about the all the recent trends and theories in physics, including the basics of string theory, with friendly explanations. Build a foundation of physics knowledge, understand the various string theories and the math behind them, and hear what the opponents to string theory have to say. It’s an exciting time to be alive in advanced physics, and this updated edition covers what’s new in the string world—the Large Hadron Collider, the Higgs Boson, gravitational waves, and lots of other big headlines. Unleash your inner armchair physicist with String Theory For Dummies. Brush up on the basics of physics and the approachable math needed to understand string theory Meet the scientists who discovered string theory and continue to make waves (and particles) in the physics world Understand what it’s all about with real-world examples and explanations Learn why string theory is called "The Theory of Everything"—and what it means for technology and the future Aspiring scientists or life-long learners will both be able to gain valuable information from this book. This accessible intro into string theory is for the theorists inside anyone.

Fundamental Interactions

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

The Forces of Nature

Beyond the Standard Model

Theory of Gravitational Interactions

Supersymmetry and String Theory

This book presents a systematic and detailed account of the classical and quantum theory of the relativistic string and some of its modifications. Main attention is paid to the first-quantized string theory with possible applications to the string models of hadrons as well as to the superstring approach to unifications of all the fundamental interactions in the elementary particle physics and to the ?cosmic? strings. Some new aspects are provided such as the consideration of the string in an external electromagnetic field and in the space-time of constant curvature (the de Sitter universe), the relativistic string loaded by point-like masses and the Cartan method for describing the classical string dynamics. The relativistic membranes and p-branes are also considered briefly. The book is sufficiently self-contained and can be considered as an introduction to this new and fast developing branch of the elementary particle physics.

Modern theories of the fundamental particles and the interactions among them have achieved a simple and coherent description of an unprecedented range of natural phenomena, but our new understanding raises intriguing new questions. Though there is a growing confidence in our ability to unify electroweak and strong interactions in a single gauge theory, gravity remains widely separated from the particle physics. In fact, road to a correct description of quantum gravity depends crucially on if experimental search methods end up with a negative or positive answer for the presence of higher-curvature space-time dimensions. Our theoretical study of general-relativistic gravitational force generated by a 1 Tev bunch of protons at Fermilab Tevatron accelerator demonstrates that the force has many similarities with the synchrotron radiation, and is in the range of sensitivity of modern low-frequency (torsion balance-type) detectors. Its measurement may open new fascinating opportunities for experimental study of the unification of gravity with other fundamental interactions presumably including the string theory.

Explores the early stages of the development of string theory; essential reading for physicists, historians and philosophers of science.

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. 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.

Supersymmetry And Unification Of Fundamental Interactions (Susy 93) - Proceedings Of The International Workshop

SUSY 95
Mind of God
String Gravity and Physics at the Planck Energy Scale
Introduction to the Relativistic String Theory
Proceedings of the International School of Subnuclear Physics

The recent high precision results from the LEP supercollider at CERN appear favorable for supergravity unification of the electroweak and the strong forces. The proceedings of the SUSY 93 Workshop focus on further precise predictions of unification which may be observed in the laboratory. In addition, the proceedings cover a wide range of other topics in supersymmetry, supergravity, particle physics, string theory and cosmology and their interconnections. They include both theoretical and experimental papers, hence presenting a complete and comprehensive picture of this important subject.

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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.

In this book, the author leads the reader, step by step and without any advanced mathematics, to a clear understanding of the foundations of modern elementary particle physics and cosmology. He also addresses current and controversial questions on topics such as string theory. The book contains gentle introductions to the theories of special and general relativity, and also classical and quantum field theory. The essential aspects of these concepts are understood with the help of simple calculations; for example, the force of gravity as a consequence of the curvature of the space-time. Also treated are the Big Bang, dark matter and dark energy, as well as the presently known interactions of elementary particles: electrodynamics, the strong and the weak interactions including the Higgs boson. Finally, the book sketches as yet speculative theories: Grand Unification theories, supersymmetry, string theory and the idea of additional dimensions of space-time. Since no higher mathematical or physics expertise is required, the book is also suitable for college and university students at the beginning of their studies. Hobby astronomers and other science enthusiasts seeking a deeper insight than can be found in popular treatments will also appreciate this unique book.

String Theory For Dummies
Gabriele Veneziano and Theoretical Physics: Historical and Contemporary Perspectives
Proceedings of the Sixteenth Lake Louise Winter Institute, Lake Louise, Alberta, Canada, 18-24 February, 2001
Effective Theories and Fundamental Interactions
A Journey Into the Unknown
String Theory and the Scientific Method

String Theory and Fundamental InteractionsGabriele Veneziano and Theoretical Physics: Historical and Contemporary PerspectivesSpringer Science & Business Media

The contemporary trends in the quantum unification of all interactions including gravity motivate this Course. The main goal and impact of modern string theory is to provide a consistent quantum theory of gravity. This, Course is intended to provide an updated understanding of the last developments and current problems of string theory in connection with gravity and the physics at the Planck energy scale. It is also the aim of this Course to discuss fundamental problems of quantum gravity in the present-day context irrespective of strings or any other models. Emphasis is given to the mutual impact of string theory, gravity and cosmology, within a deep a well defined programme, which provides, in addition, a careful interdisciplinarity. Since the most relevant new physics provided by strings concerns the quantization of gravity, we must, at least, understand string quantization in curved space-times to start. Curved space-times, besides their evident relevance m classical gravitation, are also important at energies of the order of the Planck scale. At the Planck energy, gravitational interactions are at least as important as the rest and can not be neglected anymore. Special care is taken here to provide the grounds of the different lines of research in competition (not just only one approach); this provides an excellent opportunity to learn about the real state of the discipline, and to learn it in a critical way.

The emergence of topological quantum ?eld theory has been one of the most important breakthroughs which have occurred in the context of ma- ematical physics in the last century, a century characterizedbyindependent developments of the main ideas in both disciplines, physics and mathematics, which has concluded with two decades of strong interaction between them, where physics, as in previous centuries, has acted as a source of new mat- matics. Topological quantum ?eld theories constitute the core of these p- nomena, although the main drivingforce behind it has been the enormous e?ort made in theoretical particle physics to understand string theory as a theory able to unify the four fundamental interactions observed in nature. These theories set up a new realm where both disciplines pro?t from each other. Although the most striking results have appeared on the mathema-calside,theoreticalphysicshasclearlyalsobene?tted,sincethecorresponding developments have helped better to understand aspects of the fundamentals of

?eld and string theory.

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 = mc2, 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.

String Theory, Quantum Gravity And The Unification Of The Fundamental Interactions - Proceedings Of The Conference

Unification of Fundamental Interactions

String Theory and Fundamental Interactions

Develpments in the Theory of Fundamental Interactions

Second Edition

String Theory in the Early Universe

Presents recent achievements of the theory of fundamental interactions with emphasis on strong interactions and supergravity. Covers both the mathematical problems of quantum field theory and the phenomenological implications of quantum chromodynamics. Illustrates sophisticated mathematical methods by phenomenological results.

Strings and superstrings; Algebras, lattices and strings 1986; Geometrical methods in the quantum theory of fields and strings; The heterotic string theory; Covariant quantization and the three-reggeon vertex; Supersymmetric theories of particles and interactions; Superstring phenomenology. Some remarks about string field theory; A new formulation of string theory. Covariant field theory of the interacting string; Diagonalization of the free open spining string and critical dimensions of nonlinear sigma models; Field theory of strings; The n-loop string amplitude; Strings in background fields; Strings and superspace; Orbifolds and twisted strings; Higher curvature supergravity and superstrings. Gravity from strings; Strings from gravity. The density matrix of the universe; A new class of topological terms; Random dynamics; A new hipothesis on the nature of quark and gluon confinement; Eternally existing self-reproducing inflationary universe; Superspace actions and duality transformations for N=2 tensor multiplets; Consistency of anomalies in SUSY gauge theories; Directions in string theory; The future of string theory; Superstring theory: closing talk.

International Workshop on Supersymmetry and Unification of Fundamental Interactions

From the Universe to the Elementary Particles

Geometrical Trends

Why String Theory?