Conformal Invariance An Introduction To Loops Interfaces And Stochastic Loewner Evolution Lecture Notes In Physics

An Introduction to Conformal Invariance in Quantum Field Theory and Statistical Mechanics
Introduction to Fluid Dynamics
25th Anniversary Edition
Aalborg, Denmark, 6-11 August 2012
XVIIth International Congress on Mathematical Physics
Conformal Invariance: an Introduction to Loops, Interfaces and Stochastic Loewner Evolution
Introduction to Supersymmetry in Particle and Nuclear Physics
Topics in Conformal Invariance and Generalized Sigma Models
Introduction to AdS/CFT Correspondence
Introduction to Conformal Invariance and Its Applications to Critical Phenomena
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An Introduction to Two-Dimensional Quantum Field Theory with (0,2) Supersymmetry
Nonperturbative Quantum Field Theory
Conformal Invariance in Supergravity
With Applications to String Theory
Non-Perturbative Methods in 2 Dimensional Quantum Field Theory
Conformal Field Theory
Nuclear Science Abstracts
Volume 2: Exact, Series and Renormalization Group Methods
Mathematical Physics
Finite-Size Scaling
Statistical Mechanics of Lattice Systems
High Energy Physics And Cosmology - Proceedings Of The 1990 Summer School
Proceedings of the 14th Regional Conference
Conformal Invariance and Applications to Statistical Mechanics
Conformal Invariance and Critical Phenomena
Selected Topics In Quantum Field Theory And Mathematical Physics

An Introduction to Loops, Interfaces and Stochastic Loewner Evolution
Conformal Invariance
Energy Research Abstracts
Introduction to the Classical Theory of Particles and Fields
A Selection of Papers in Memoriam Kurt Symanzik
Introduction to Vertex Operator Algebras and Their Representations
Introduction to Algebraic and Constructive Quantum Field Theory

EVELIN AYDIN

An Introduction to Conformal Invariance in Quantum Field Theory and Statistical Mechanics World Scientific
The authors present a rigorous treatment of the first principles of the algebraic and analytic core of quantum field theory. Their aim is to correlate modern mathematical theory with the explanation of the observed process of particle production and of particle-wave duality that heuristic quantum field theory provides. Many topics are treated here in book form for the first time, from the origins of complex structures to the quantization of tachyons and domains of dependence for quantized wave equations. This work begins with a comprehensive analysis, in a universal format, of the structure and characterization of free fields, which is illustrated by applications to specific fields. Nonlinear local functions of both free fields (or Wick products) and interacting fields are established mathematically in a way that is consistent with the basic physical constraints and practice. Among other topics discussed are functional integration, Fourier transforms in Hilbert space, and implementability of canonical transformations. The authors address readers interested in fundamental mathematical physics and who have at least the training of an entering graduate student. A series of lexicons connects the mathematical development with the underlying physical motivation or interpretation. The examples and problems illustrate the theory and relate it to the scientific literature. Originally published in 1992. The Princeton Legacy Library uses the latest print-on-demand technology to again make available previously out-of-print books from the distinguished backlist of Princeton University Press. These editions preserve the original texts of these important books while presenting them in durable paperback and hardcover editions. The goal of the Princeton Legacy Library is to vastly increase access to the rich scholarly heritage found in the thousands of books published by Princeton University Press since its founding in 1905.
Introduction to Fluid Dynamics Springer Science & Business Media
During the past 15 years, quantum field theory and classical statistical mechanics have merged into a single field, and the need for nonperturbative methods for the description of critical phenomena in statistical mechanics as well as for problems in elementary particle physics are generally acknowledged. Such methods formed the central theme of the 1987 Cargese Advanced Study Institut. e on "Nonpert. urbat. ive Quantum Field Theory." The

use of conformal symmet. ry has been of central interest in recent years, and was a main subject at. t. he ASI. Conformal invariant quantum field theory describes statistical mechanical systems exactly at a critical point, and can be analysed to a remarkable ext. ent. by group t. heoretical methods. Very strong results have been obtained for 2-dimensional systems. Conformal field theory is also the basis of string theory, which offers some hope of providing a unified t. heory of all interactions between elementary particles. Accordingly, a number of lectures and seminars were presented on these two topics. After syst. ematic introductory lectures, conformal field theory on Riemann surfaces, orbifolds, sigma models, and application of loop group theory and Grassmannians were discussed, and some ideas on modular geometry were presented. Other lectures combined' traditional techniques of constructive quant. um field theory with new methods such as the use of index-t. heorems and infinite dimensional (Kac Moody) symmetry groups. The problems encountered in a quantum mechanical description of black holes were discussed in detail.

25th Anniversary Edition American Mathematical Soc.

Theoretical physicists have predicted that the scaling limits of many two-dimensional lattice models in statistical physics are in some sense conformally invariant. This belief has allowed physicists to predict many quantities for these critical systems. The nature of these scaling limits has recently been described precisely by using one well-known tool, Brownian motion, and a new construction, the Schramm-Loewner evolution (SLE). This book is an introduction to the conformally invariant processes that appear as scaling limits. The following topics are covered: stochastic integration; complex Brownian motion and measures derived from Brownian motion; conformal mappings and univalent functions; the Loewner differential equation and Loewner chains; the Schramm-Loewner evolution (SLE), which is a Loewner chain with a Brownian motion input; and applications to intersection exponents for Brownian motion. The prerequisites are first-year graduate courses in real analysis, complex analysis, and probability. The book is suitable for graduate students and research mathematicians interested in random processes and their applications in theoretical physics.

Aalborg, Denmark, 6-11 August 2012 Springer Science & Business Media

This School presented topics of current interest in high energy physics including Superstrings, Unified Theories and Cosmology.

XVIIth International Congress on Mathematical Physics American Mathematical Soc.

This volume contains Introductory Notes and major reprints on conformal field theory and its applications to 2-dimensional statistical mechanics of critical phenomena. The subject relates to many different areas in contemporary physics and mathematics, including string theory, integrable systems, representations of infinite Lie algebras and automorphic functions.

Contents:General Principles:Infinite Conformal Symmetry in Two-dimensional Quantum Field Theory (A A Belavin et al.)Conformal Invariance and Surface Critical Behaviour (J Cardy)Mathematical Background:Contravariant Form for Infinite-dimensional Lie Algebras and Superalgebras (V Kac)Verma Modules over the Virasoro Algebra (B Feigin & D

Fuks)Unitary Representations of the Virasoro and Super-Virasoro Algebras (P Goddard et al.)Critical Models and Computation of Correlations:Conformal Algebra and Multipoint Correlation Functions in 2D Statistical Models (Vl Dotsenko & V Fateev)On the Identification of Finite Operator Algebras in Two-dimensional Conformally Invariant Field Theories (P Christe & R Flume)Finite Size Scaling:Conformal Invariance, the Central Charge and Universal Finite Size Amplitudes at Criticality (H Blöte et al.)Universal Term in the Free Energy at a Critical Point and the Conformal Anomaly (I Affleck)Exact Surface and Wedge Exponents for Polymers in Two Dimensions (B Duplantier & H Saleur)Modular Invariance:Modular Invariant Partition Functions in Two Dimensions (A Cappelli et al.)Modular Invariant Partition Functions for Parafermionic Field Theories (D Gepner & Z Qiu)Discrete Symmetries of Conformal Theories (J-B Zuber)Connections With Integrable Systems:Exact Exponents for Infinitely many New Multicritical Points (D Huse)Automorphic Properties of Local Height Probabilities for Integrable Solid-on-solid Models (E Date et al.)Models with c = 1:Correlation Functions on the Critical Lines of the Baxter and Ashkin-Teller Models (L Kadanoff & A Brown)Supersymmetric Critical Phenomena and the Two Dimensional Gaussian Model (D Friedan & S Shenker)Curiosities at c=1 (P Ginsparg)Coulomb Gas Picture:Lattice Derivation of Modular Invariant Partition Functions on the Torus (V Pasquier)Vicinity of the Critical Point:Integrals of Motion in Scaling 3-state Potts Model Field Theory (A Zamolodchikov)Correlation Functions and Higher Topology:The Conformal Field Theory of Orbifolds (L Dixon et al.)Conformal and Current Algebras on a General Riemann Surface (T Eguchi & H Ooguri)and other papers Readership: Theoretical physicists in particle and statistical physics and mathematicians.

Conformal Invariance: an Introduction to Loops, Interfaces and Stochastic Loewner Evolution Springer Science & Business Media

Conformal invariance has been a spectacularly successful tool in advancing our understanding of the two-dimensional phase transitions found in classical systems at equilibrium. This volume sharpens our picture of the applications of conformal invariance, introducing non-local observables such as loops and interfaces before explaining how they arise in specific physical contexts. It then shows how to use conformal invariance to determine their properties. Moving on to cover key conceptual developments in conformal invariance, the book devotes much of its space to stochastic Loewner evolution (SLE), detailing SLE’s conceptual foundations as well as extensive numerical tests. The chapters then elucidate SLE’s use in geometric phase transitions such as percolation or polymer systems, paying particular attention to surface effects. As clear and accessible as it is authoritative, this publication is as suitable for non-specialist readers and graduate students alike.

Introduction to Supersymmetry in Particle and Nuclear Physics American Mathematical Soc.

Kurt Symanzik was certainly one of the most outstanding theoretical physicists of our time. For thirty years, until his untimely death in 1983, he helped to shape the present form of quantum field theory and its application to elementary

particle physics. In memoriam of Kurt" Symanzik leading scientists present their most recent results, giving, at the same time, an overview of the state of the art. This collection was originally published in Vol. 97, 1/2 (1985) of Communications in Mathematical Physics. They range over various inter related topics of interest to Kurt Symanzik. We hope that making this collection available in an accessible and inexpensive way will benefit the physics community. The Publisher Contents To the Memory of Kurt Symanzik 1 By A. Jaffe, H. Lehmann, and G. Mack Monte Carlo Simulations for Quantum Field Theories Involving Fermions. By M. Karowski, R. Schrader, and H. J. Thun (With 8 Figures) . . . . . 5 SU(2) Lattice Gauge Theory: Standard Action Versus Symanzik's Tree-Improved Action. By B. Berg, A. Billoire, S. Meyer, and C. Panagiotakopoulos (With 13 Figures). . . . . 31 . On-shell Improved Lattice Gauge Theories By M. Luscher and P. Weisz (With 3 Figures) . . . . . 59 On the Modular Structure of Local Algebras of Observables By K. Fredenhagen . . . . . 79 . . . The Intersection of Brownian Paths as a Case Study of a Renormalization Group Method for Quantum Field Theory By M. Aizenman (With 3 Figures). . . . . 91 Intersection Properties of Simple Random Walks: A Renormalization Group Approach. By G. Felder and J. Frohlich. . . . . 111 .

Topics in Conformal Invariance and Generalized Sigma Models Springer

This volume offers an excellent selection of cutting-edge articles about fractal geometry, covering the great breadth of mathematics and related areas touched by this subject. Included are rich survey articles and fine expository papers. The high-quality contributions to the volume by well-known researchers--including two articles by Mandelbrot--provide a solid cross-section of recent research representing the richness and variety of contemporary advances in and around fractal geometry. In demonstrating the vitality and diversity of the field, this book will motivate further investigation into the many open problems and inspire future research directions. It is suitable for graduate students and researchers interested in fractal geometry and its applications. This is a two-part volume. Part 1 covers analysis, number theory, and dynamical systems; Part 2, multifractals, probability and statistical mechanics, and applications.

Introduction to AdS/CFT Correspondence Springer Science & Business Media

This volume is intended as a systematic introduction to gauge field theory for advanced undergraduate and graduate students in high energy physics. The discussion is restricted to the classical (non-quantum) theory in Minkowski spacetime. Particular attention has been given to conceptual aspects of field theory, accurate definitions of basic physical notions, and thorough analysis of exact solutions to the equations of motion for interacting systems.

Introduction to Conformal Invariance and Its Applications to Critical Phenomena World Scientific

* Introduces the fundamental theory of vertex operator algebras and its basic techniques and examples. * Begins with a detailed presentation of the theoretical foundations and proceeds to a range of applications. * Includes a number of new, original results and brings fresh perspective to important works of many other researchers in algebra, lie theory, representation theory, string theory, quantum field theory, and other areas of

math and physics.
Springer Science & Business Media
This primer develops Conformal Field Theory (CFT) from scratch, whereby CFT is viewed as any conformally-invariant theory that describes a fixed point of a renormalization group flow in quantum field theory. The book is divided into four lectures: Lecture 1 addresses the physical foundations of conformal invariance, while Lecture 2 examines the constraints imposed by conformal symmetry on the correlation functions of local operators, presented using the so-called projective null cone – a procedure also known as the embedding formalism. In turn, Lecture 3 focuses on the radial quantization and the operator product expansion, while Lecture 4 offers a very brief introduction to the conformal bootstrap. Derived from course-based notes, these lectures are intended as a first point of entry to this topic for Master and PhD students alike.
Quantum Field Theory Conformal Invariance: an Introduction to Loops, Interfaces and Stochastic Loewner Evolution
Concise, unified, and logical introduction to study of the basic principles of fluid dynamics emphasizes statement of problems in mathematical language. Assumes familiarity with algebra of vector fields. 1963 edition.
Nuclear Science Abstracts Courier Dover Publications
Based on class-tested notes, this text offers an introduction to Conformal Field Theory with a special emphasis on computational techniques of relevance for String Theory. It introduces Conformal Field Theory at a basic level, Kac-Moody algebras, one-loop partition functions, Superconformal Field Theories, Gepner Models and Boundary Conformal Field Theory. Eventually, the concept of orientifold constructions is explained in detail for the example of the bosonic string. In providing many detailed CFT calculations, this book is ideal for students and scientists intending to become acquainted with CFT techniques relevant for string theory but also for students and non-specialists from related fields.
Schramm–Loewner Evolution
Springer
The second edition of Non-Perturbative Methods in Two-Dimensional Quantum Field Theory is an extensively revised version, involving major changes and additions. Although much of the material is special to two dimensions, the techniques used should prove helpful also in the development of techniques applicable in higher dimensions. In particular, the last three chapters of the book will be of direct interest to researchers wanting to work in the field of conformal field theory and strings. This book is intended for students working for their PhD degree and post-doctoral researchers wishing to acquaint themselves with the non-perturbative aspects of quantum field theory. Contents:Free FieldsThe Thirring ModelDeterminants and Heat KernelsSelf-Interacting Fermionic ModelsNonlinear σ Models: Classical AspectsNonlinear σ Models — Quantum AspectsExact S-Matrices of 2D ModelsThe Wess-Zumino-Witten TheoryQED2: Operator ApproachQuantum ChromodynamicsQED2: Functional ApproachThe Finite Temperature Schwinger ModelNon-Abelian Chiral Gauge TheoriesChiral Quantum ElectrodynamicsConformally Invariant Field TheoryConformal Field Theory with Internal Symmetry2D Gravity and String-Related Topics Readership: Graduate

students and researchers in high energy and quantum physics.
Keywords:Reviews:“... there are carefully written chapters on the Thirring, Gross-Neveu, and nonlinear Sigma models, as well as the sine-Gordon and Wess-Zumino-Witten theory ... In particular, the last three chapters might be of interest to those who work in string theory, in view of the recently discovered AdS/CFT correspondence.”Mathematics Abstracts
The Landscape of Free Fermionic Gauge Models Springer Science & Business Media
The history of critical phenomena goes back to the year 1869 when Andrews discovered the critical point of carbon dioxide, located at about 31°C and 73 atmospheres pressure. In the neighborhood ofthis point the carbon dioxide was observed to become opalescent, that is, light is strongly scattered. This is nowadays interpreted as comingfrom the strong fluctuations of the system close to the critical point. Subsequently, a wide varietyofphysicalsystems were realized to display critical points as well. Ofparticular importance was the observation of a critical point in ferromagnetic iron by Curie. Further examples include multicomponent fluids and alloys, superfluids, superconductors, polymers and may even extend to the quark-gluon plasmaand the early universe as a whole. Early theoretical investigationstried to reduce the problem to a very small number of degrees of freedom, such as the van der Waals equation and mean field approximations and culminating in Landau's general theory of critical phenomena. In a dramatic development, Onsager's exact solutionofthe two-dimensional Ising model made clear the important role of the critical fluctuations. Their role was taken into account in the subsequent developments leading to the scaling theories of critical phenomena and the renormalization group. These developements have achieved a precise description of the close neighborhood of the critical point and results are often in good agreement with experiments. In contrast to the general understanding a century ago, the presence of fluctuations on all length scales at a critical point is today emphasized.

Gravitation and Gauge Symmetries Springer Science & Business Media
Conformal invariance has been a spectacularly successful tool in advancing our understanding of the two-dimensional phase transitions found in classical systems at equilibrium. This volume sharpens our picture of the applications of conformal invariance, introducing non-local observables such as loops and interfaces before explaining how they arise in specific physical contexts. It then shows how to use conformal invariance to determine their properties. Moving on to cover key conceptual developments in conformal invariance, the book devotes much of its space to stochastic Loewner evolution (SLE), detailing SLE’s conceptual foundations as well as extensive numerical tests. The chapters then elucidate SLE’s use in geometric phase transitions such as percolation or polymer systems, paying particular attention to surface effects. As clear and accessible as it is authoritative, this publication is as suitable for non-specialist readers and graduate students alike.
Shape, Smoothness, and Invariant Stratification of an Attracting Set for Delayed Monotone Positive Feedback
#N/A

Filling an important gap in the literature, this comprehensive text develops conformal field theory from first principles. The treatment is self-contained, pedagogical, and exhaustive, and includes a great deal of background material on quantum field theory, statistical mechanics, Lie algebras and affine Lie algebras. The many exercises, with a wide spectrum of difficulty and subjects, complement and in many cases extend the text. The text is thus not only an excellent tool for classroom teaching but also for individual study. Intended primarily for graduate students and researchers in theoretical high-energy physics, mathematical physics, condensed matter theory, statistical physics, the book will also be of interest in other areas of theoretical physics and mathematics. It will prepare the reader for original research in this very active field of theoretical and mathematical physics.

An Introduction to Two-Dimensional Quantum Field Theory with (0,2) Supersymmetry World Scientific

This book introduces two-dimensional supersymmetric field theories with emphasis on both linear and non-linear sigma models. Complex differential geometry, in connection with supersymmetry, has played a key role in most developments of the last thirty years in quantum field theory and string theory. Both structures introduce a great deal of rigidity compared to the more general categories of non-supersymmetric theories and real differential geometry, allowing for many general conceptual results and detailed quantitative predictions. Two-dimensional (0,2) supersymmetric quantum field theories provide a natural arena for the fruitful interplay between geometry and quantum field theory. These theories play an important role in string theory and provide generalizations, still to be explored fully, of rich structures such as mirror symmetry. They also have applications to non-perturbative four-dimensional physics, for instance as descriptions of surface defects or low energy dynamics of solitonic strings in four-dimensional supersymmetric theories. The purpose of these lecture notes is to acquaint the reader with these fascinating theories, assuming a background in conformal theory, quantum field theory and differential geometry at the beginning graduate level. In order to investigate the profound relations between structures from complex geometry and field theory the text begins with a thorough examination of the basic structures of (0,2) quantum field theory and conformal field theory. Next, a simple class of Lagrangian theories, the (0,2) Landau-Ginzburg models, are discussed, together with the resulting renormalization group flows, dynamics, and symmetries. After a thorough introduction and examination of (0,2) non-linear sigma models, the text introduces linear sigma models that, in particular, provide a unified treatment of non-linear sigma models and Landau-Ginzburg theories. Many exercises, along with discussions of relevant mathematical notions and important open problems in the field, are included in the text.

Nonperturbative Quantum Field Theory Springer Science & Business Media

Critical phenomena arise in a wide variety of physical systems. Classi cal examples are the liquid-vapour critical point or the paramagnetic ferromagnetic transition. Further examples include multicomponent fluids and alloys,

superfluids, superconductors, polymers and fully developed tur bulence and may even extend to the quark-gluon plasma and the early uni verse as a whole. Early theoretical investigators tried to reduce the problem to a very small number of degrees of freedom, such as the van der Waals equation and mean field approximations, culminating in Landau's general theory of critical phenomena. Nowadays, it is understood that the common ground for all these phenomena lies in the presence of strong fluctuations of infinitely many coupled variables. This was made explicit first through the exact solution of the two-dimensional Ising model by Onsager. Systematic subsequent developments have been leading to the scaling theories of critical phenomena and the renormalization group which allow a precise description of the close neighborhood of the critical point, often in good agreement with experiments. In contrast to the general understanding a century ago, the presence of fluctuations on all length scales at a critical point is emphasized today. This can be briefly summarized by saying that at a critical point a system is scale invariant. In addition, conformal invaTiance permits also a non-uniform, local rescal ing, provided only that angles remain unchanged.

Conformal Invariance in Supergravity
Springer
A pedagogical and self-contained introduction to AdS/CFT correspondence aimed at graduate students and researchers across theoretical physics.