

<<玻色化和强关联系统>>

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作者：高戈林

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前言

We used to think that if we know one, we knew two, because one and one are two. We are finding that we must learn a great deal more about and. Sir Arthur Eddington, from *The Harvest of a Quiet Eye*, by A. Mackay. The behaviour of large and complex aggregations of elementary particles, it turns out, is not to be understood in terms of a simple extrapolation of the properties of a few particles. Instead, at each level of complexity entirely new properties appear, and the understanding of the new behaviours requires research which I think is as fundamental in its nature as any other. E. W. Anderson, from *More is Different* (1972). High energy physics continues to fascinate people inside and outside of science, being perceived as the 'most fundamental' area of research. It is believed somehow that the deeper inside the matter we go the closer we get to the truth. So it is believed that 'the truth is out there' - at high energies, small distances, short times. Therefore the ultimate theory, Theory of Everything, must be a theory operating at the smallest distances and times possible where there is no difference between gravitational and all other forces (the Planck scale). All this looks extremely revolutionary and complicated, but once a condensed matter physicist has found time and courage to acquaint himself with these ideas and theories, these would not appear to him utterly unfamiliar. Moreover, despite the fact that the two branches of physics study objects of vastly different sizes, the deeper into details you go, the more parallels you will find between the concepts used. In many cases the only difference is that models are called by different names, but this has more to do with funding than with the essence.

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内容概要

Technical aspects of bosonization、 A simple case of Bose-Fermi equivalence: Jordan-Wigner、 Transformation
、 One-dimensional fermion States near the Fermi points、 Chiral anomaly、 Anomalous commutators
、 Gaussian model. Lagrangian formulation、 Bosonization、 Interaction with an electromagnetic field; gauge
invariance、 Conformal symmetry and finite size effects、 Gaussian model in the Hamiltonian formulation
、 Virasoro algebra、 Ward identities等等。

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作者简介

作者: (英) 高戈林

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书籍目录

Preface Acknowledgements Part I : Technical aspects of bosonization A simple case of Bose-Fermi equivalence: Jordan-Wigner transformation One-dimensional fermion states near the Fermi points Chiral anomaly Anomalous commutators Gaussian model. Lagrangian formulation Bosonization Interaction with an electromagnetic field; gauge invariance Conformal symmetry and finite size effects Gaussian model in the Hamiltonian formulation Virasoro algebra Ward identities Subalgebra $sl(2)$ Structure of Hilbert space in conformal theories Differential equations for correlation functions Dotsenko—Fateev bosonization scheme for the minimal models Current (Kac-Moody) algebras; the first assault Sugawara Hamiltonian for Wess-Zumino-Novikov-Witten model Knizhnik-Zamolodchikov (KZ) equations Relevant and irrelevant fields Bose-Einstein Condensation in two dimensions; Beresinskii-Kosterlitz-Thouless transition The sine-Gordon model The renormalization group analysis Exact solution of the sine-Gordon model Spin $S=1/2$ Heisenberg-Ising chain Explicit expression for the dynamical magnetic susceptibility Ising model More about the WZNW model Special cases 1.1 $SU(2)$ WZNW model as a Gaussian model 1.2 $SU(2)$ WZNW model and the Ising model 1.3 $SU(4)$ as a theory of two bosonic fields 1.4 $SU(3)$ as a theory of three bosonic fields Deformation of the WZNW model and coset constructions Non-Abelian bosonization WZNW model in the Lagrangian formulation Derivation of the Lagrangian Calculation of a nontrivial determinant Part II : Application of the bosonization technique to physical Part III Single impurity problems

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章节摘录

插图：This volume provides a detailed account of bosonization. This important technique represents one of the most powerful nonperturbative approaches to many-body systems currently available. The first part of the book examines the technical aspects of bosonization. Topics include one-dimensional fermions, the Gaussian model, the structure of Hilbertspace in conformal theories, Bose-Einstein condensation in two dimensions, non-Abelian bosonization, and the Ising and WZNW models. The second part presents applications of the bosonization technique to realistic models including the Tomonaga-Luttinger liquid, spin liquids in one dimension and the spin-1/2 Heisenberg chain with alternative exchange. The third part addresses the problems of quantum impurities. Chapters cover potential scattering, the X-ray edge problem, impurities in Tomonaga-Luttinger liquids and the multi-channel Kondo problem. This book will be an excellent reference for researchers and graduate students working in theoretical physics, condensed matter physics and field theory.

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