

PREFACE

The interest in Logarithmic Conformal Field Theory started with Victor Gurarie's paper in 1993, although earlier indications that logarithms can appear in correlators of conformal field theory had existed for some time, as noted by Hubert Saleur and Vadim Knizhnik. The interest in logarithmic conformal field theory grew over the years although all known examples are non-unitary field theories. This is mainly due to the fact that logarithmic conformal field theory involves indecomposable representations, which leads to many intriguing mathematical structures and important physical consequences.

Logarithmic conformal field theory enjoys an increasing number of interesting applications, in particular in statistical mechanics, condensed matter physics and turbulence. The presence of so-called logarithmic partner fields spanning the indecomposable representations, perhaps startling at first glance, does in fact prove crucial in various theoretical models. To name just one example, disordered Dirac fermions are successfully described by a logarithmic conformal field theory, while more common approaches, for example via the replica method, yield incorrect results, as shown by J.-S. Caux, N. Taniguchi and A.M. Tsvelik.

Due to such successes as well as the growing interest and level of activity in logarithmic conformal field theory, we felt that a workshop on the topic would receive sufficient attention. Thus, a workshop was held in the *Institute for Studies in Theoretical Physics and Mathematics*, Tehran, Iran, which took place 4–18 September 2001. We were lucky to receive support from the *International Center for Theoretical Physics*, Trieste, Italy, and the *Ministry of Science, Research and Technology*, as well as the host institute.

The event was organized as a series of review talks as well as research articles. What is collected here is a selection of papers presented during the workshop, which have both, a pedagogical nature and a direct relevance to the topic. We believe that this volume will serve as a reference for all experts and researchers in the field of logarithmic conformal field theory. Logarithmic conformal field theory is not yet as thoroughly understood and mathematically founded as ordinary conformal field theory, and many questions remain open. Therefore, we hope that this volume will help scientists to enter this still young field of research. The field is evolving fast, and thus some new developments have taken place since this workshop was held, improving in particular the mathematical understanding of logarithmic conformal field theories and opening new directions for applications such as two-dimensional

percolation. However, these proceedings should be sufficient to enable the reader to easily gain access to the current state of research.

This workshop served not only as a forum for, at the time, up to date presentation of results in logarithmic conformal field theory, but also as a setting for meetings and discussions of the researchers in the field. This proved successful, since there were many and fruitful discussions in a relaxed and yet concentrated atmosphere, and it demonstrated that the time was right to bring together the logarithmic conformal field theory community. In fact, the success of this meeting led to the idea to hold such workshops on recent developments in logarithmic conformal field theory and related topics on a regular basis. The second workshop, *Non-Unitary/Logarithmic CFT*, was organized by IHÉS, Orsay and Saclay in France, and took place 10–14 June 2002 at the Institute des Hautes Études Scientifique, Bures-sur-Yvette, France. The next workshop is scheduled to take place 2003.

We like to take this opportunity to thank every one involved in the organization of the workshop, members of the organizing committee, Dr. Rahimi-Tabar and Dr. Arfaei and staff members of the Physics Department of the *Institute for Studies in Theoretical Physics and Mathematics* without whose help this event would have not been possible.

We finally would like to mention that the meeting was dedicated to the memory of late Professor L. O’Raifeartaigh.

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