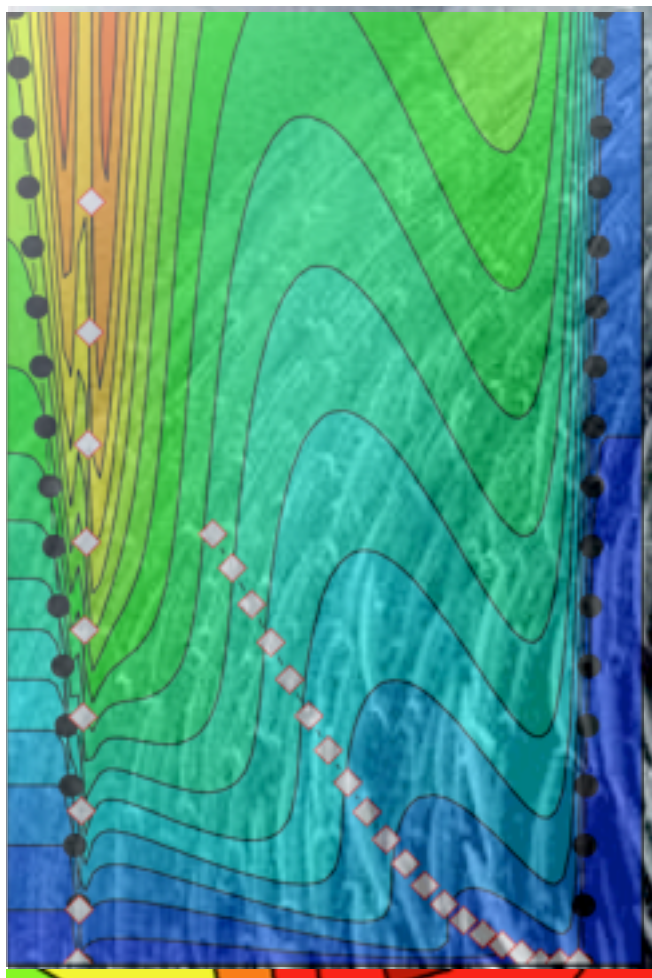

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Quantum critical matter in one dimension

时间：3月19日下午4：30　地点：频标楼三楼会议室

In this talk, we demonstrate the universal Tomonaga-Luttinger liquid (TLL) and quantum criticality in one dimensional (1D) interacting bosons, fermions and spin liquids. Not only do these systems continue to inspire significant developments in mathematics and physics, they are also highly relevant to many current experiments with cold atoms and spins.

Using exact results we study the Lieb-Liniger Bose gas at quantum criticality. It presents a non-relativistic free fermion theory in the critical regime and a relativistic TLL below a universal crossover temperature.

In particular, the exact results elucidate the novel Fulde-Ferrell-Larkin-Ovchinnikov pairing state, correlations and quantum phase transitions in the archetypical model of spin-1/2 attractive fermions in 1D. Our prediction of the phase diagram of this system was confirmed experimentally by Hulet's group at Rice University (Nature 467, 567 (2010)). Moreover, we prove that the critical properties of the system are described by free fermions with mass m and 2m and dynamic exponent $z = 2$ and correlation length exponent $\nu = 1/2$.

For 1D quantum Bose and Fermi gases with higher symmetries, we have made a breakthrough in obtaining the universal TLL physics and quantum criticality of the systems. These results open up many new directions for study, including magnetism, multi-component TLL phases and their critical behaviour caused by population imbalances.