



The Chinese University of Hong Kong
Department of Physics and Institute of Theoretical Physics

Lecture Series

Duality in Quantum Field Theory and It's Application in Condensed Matter Systems

by

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	Date	Time	Place
Lecture 1	November 25 (Fri)	3:00 – 5:00 pm	G25, Science Centre, CUHK
Lecture 2	December 1 (Thu)	3:00 – 5:00 pm	G26, Science Centre, CUHK
Lecture 3	December 8 (Thu)	3:00 – 5:00 pm	G26, Science Centre, CUHK

Abstract

Duality refers to two equivalent descriptions of the same theory from different points of view. Recently there has been tremendous progress in formulating and understanding possible dualities of quantum many body theories in 2+1 spacetime dimensions. The appreciation of the possible dual descriptions of such theories has greatly enhanced our understanding of some challenging questions about such quantum critical points. Here we will try to provide a pedagogical review of these recent developments. We will also talk about some progress on generalizations of the deconfined quantum critical points to 3+1 dimensions.

1. Some basic (field theoretic) dualities in 1d and 2d.
2. Duality web of deconfined quantum criticality, status of current numerics, conformal bootstrap, etc.
3. Gauge theories and deconfined quantum criticalities in 3d.

The first two lectures will be based on these reviews:

<https://journals.aps.org/prx/pdf/10.1103/PhysRevX.7.031051>

The third part will be based the following two papers:

<https://journals.aps.org/prresearch/abstract/10.1103/PhysRevResearch.2.023031>

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