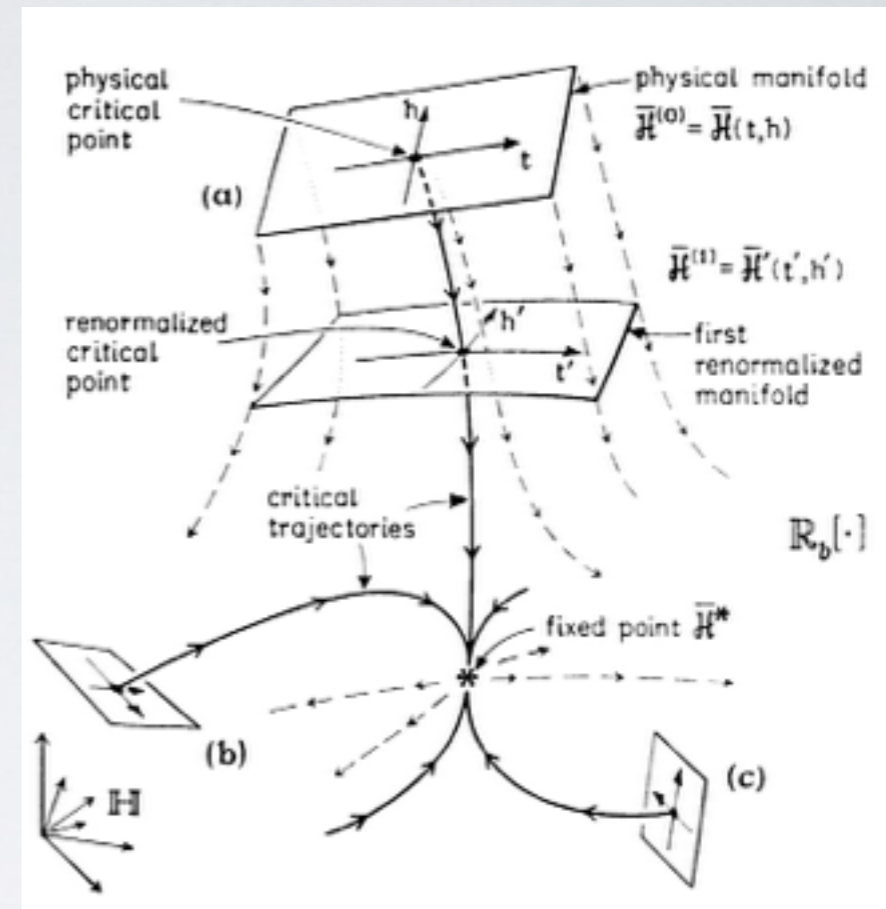


# SCALING AND THE RENORMALIZATION GROUP: AN INTRODUCTION (PHYS 730)

Spring 2015

The **renormalization group (RG)** is one of the most important concepts of modern science. Invented initially – and quite independently – in statistical mechanics and particle physics, it is now used, as a concept and as a calculational tool all over theoretical physics and beyond. Some of its applications include the analysis and definition of quantum field theory, the study of critical points in classical statistical systems – ranging from magnets and fluids to polymers, spin glasses and neural networks, earthquakes, and the stock market – the study of ‘quantum criticality’ and the proof of the Poincaré conjecture.

The purpose of this class is to give a general, elementary introduction to the topic, with an emphasis on qualitative ideas, and a detailed study of the basic elementary computations – such as the famous ‘epsilon expansion’. The first part of the course will focus on the statistical mechanics approach to the RG, while the second part will tackle slightly more advanced topics, such as quantum criticality, the RG for fermions, and the RG in general quantum field theory. The technical level will be kept rather elementary, and only a first year graduate knowledge of statistical mechanics and quantum mechanics will be assumed.



A physical system seen from the general RG viewpoint (from Rev. Mod. Phys. 70, 653 (1998)).

## Scheduling:

The class will follow an intense schedule of two 3-hour classes per week starting the week of January 20th until mid spring. For further information contact Prof. H. Saleur: [saleur@usc.edu](mailto:saleur@usc.edu)