Condensed Matter Theory Center Seminar

Wednesday, July 3
11:00 am – 12:30 pm, Physics Building 2205

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"A mapping between finite temperature classical and zero temperature quantum systems in general dimensions and its consequences for various quantum liquids and glasses"

Many electronic systems exhibit striking features in their dynamical response over a prominent range of experimental parameters. While there are empirical suggestions of particular increasing length scales that accompany such transitions, this identification is not universal. To better understand such behavior, we extend and employ a mapping between finite temperature classical Fokker-Planck systems and related quantum systems at zero temperature. Our duality illustrates that a Wick rotation relates (i) dynamics in general finite temperature classical dissipative systems to (ii) zero temperature dynamics in the corresponding dual many-body quantum systems. Using this new correspondence, we illustrate that, even in the absence of imposed disorder, many continuum quantum fluid systems (and possible lattice counterparts) may exhibit a zero-point "quantum dynamical heterogeneity" wherein the dynamics, at a given instant, is spatially non-uniform. While the static length scales accompanying this phenomenon do not exhibit a clear divergence in standard correlation functions, the length scale of the dynamical heterogeneities can increase dramatically. We study "quantum jamming" and illustrate how systems may undergo a zero temperature quantum critical metal-to-insulator-type transition with length scales that increase far more slowly than the relaxation time. We suggest ways to analyze experimental data.

(All are welcome to attend)

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