Abstract:
Although the quantum-classical correspondence is well laid out for a single particle in a closed quantum system, it is not at all clear that such a correspondence holds generically in many-body systems. At the same time our experimental capacities in high-precision control of quantum many-body systems has continued to expand rapidly, spurred in good part by developments at the many institutions engaged in the creative development of ultracold quantum gas architectures for quantum information processing. Thus the search for macroscopic quantum effects, or even beyond-quantum effects, is presently a rapidly growing field. In this talk, I will discuss a key emergent feature of attractive Bose-Einstein condensates. This well-established system presents many puzzles, amongst them the lack of an established semiclassical limit for far-from-equilibrium dynamics of emergent features like bright solitons. Such localized "lumps" self-cool at the semiclassical level and are incredibly robust against perturbations. Yet a close examination of their entangled dynamics with matrix-product state methods yields a completely different prediction from the semiclassical one, in particular for an order two soliton. If experiments bear out this prediction, we will have found a truly macroscopic quantum state against which the predictions of many-body quantum mechanics can be tested at a whole new level.

Thursday, March 21, 2019
4:30 PM in SCI 242

Refreshments will be served at 4:20 p.m.