Caustics in Many-Body Quantum Dynamics

Wyatt Kirkby, PhD. candidate
McMaster University

I begin this two-part presentation with a discussion of caustics, a well-known phenomenon which arises from the natural focusing of rays. Caustics represent envelopes of rays which in turn lead to singularities in classical theories. In order to accurately capture the physics, these singularities must be resolved by 'smoothing' them out using wave interference, with common examples appearing in optics. We examine here the presence of caustics arising in many-body quantum dynamics, whereby focusing occurs in the classical trajectories of particles. Connections will be made with a branch of mathematics known as *catastrophe theory*, and how we can connect the presence of caustics with universal behaviour and phase transitions.
I will end the talk with a look at my personal experience as a graduate student: the transition from StFX to McMaster, how graduate student life is different than the undergraduate experience, and lessons I've learned from my time at McMaster.