

- **Two dimensional quantum memories**  
**David Poulin (Université de Sherbrooke)**

I will present an overview of recent advances in our understanding of two-dimensional quantum memories. In such memories, information is stored in the degenerate ground state of a many-body quantum system. Under a certain set of conditions collectively known as “local topological order”, the low energy spectrum of a many-body system is robust to local perturbations. This has the consequence that quantum information encoded in the degenerate ground state of such a system is stable at zero temperature. On the other hand, the existence of a macroscopic energy barrier between ground states imply that information encoded in the low energy manifold is robust against thermal fluctuations. Here, we demonstrate that in two spacial dimensions, local topological order prohibits the existence of an energy barrier, which shows a tradeoff between robustness to quantum and thermal fluctuations.