The pursuit of exactness in many-body quantum physics

Prof. Jean-Sébastien Caux

Institute of Physics, University of Amsterdam

What is known as the “many-body problem” is the simple fact that our theoretical toolbox is generally incapable of handling systems containing many mutually interacting quantum particles. In one dimension, there exist however special theories for which exact solutions of the Schrödinger equation can be found. Long viewed as exceptional artifacts or irrelevant curiosities, these “integrable systems" have now come to play a major role in our understanding of quantum statistical mechanics and strongly-correlated systems.

This colloquium will motivate the importance and relevance of these theories, by showcasing how they relate to experimental realizations in magnetic and cold atomic systems, highlighting what they teach us about fundamental concepts such as equilibration, thermalization and universality, and hinting at what the future of (out-of-equilibrium) many-body quantum physics might hold in reserve.