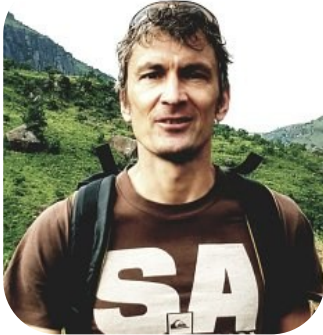


S E M I N A R



Prof Michael Kastner
(Stellenbosch University)

Date:
Tuesday, 21 April 2026

Time:
14h10-15h10 SAST

- Venues:**
- [NITheCS Seminar Room](#)
University of KwaZulu-Natal
Westville Campus
3rd Floor, H-Block,
School of Chemistry and Physics
 - [Online](#)

WHO SHOULD ATTEND?

The seminar will be accessible to advanced undergraduates, postgraduate students and researchers in mathematics and computer science. All are welcome.

ENQUIRIES:

Email Dr Cerene Rathilal:
RathilalC@ukzn.ac.za

Universality and scaling in open quantum systems under cooling dynamics

ABSTRACT

Universality, characterised by critical exponents, is well established in the vicinity of equilibrium phase transitions. Far less is known about universality in nonequilibrium settings. The quantum Kibble–Zurek mechanism demonstrates that, in closed many-body quantum systems and under suitable driving protocols, universal features of the equilibrium phase transition are imprinted onto nonequilibrium observables. In this talk, I present a complementary scenario: the emergence of scaling and universality in open quantum systems subjected to cooling dynamics toward a quantum critical point. I show that the excess excitation density, which quantifies the degree of adiabaticity, obeys universal scaling laws with respect to the cooling rate and other control parameters. These scaling laws are governed by the critical exponents of the underlying equilibrium quantum phase transition. The results are established analytically for a Kitaev quantum wire coupled to Markovian baths, and I argue that the conclusions extend to a broader class of systems. This work demonstrates that critical properties at zero temperature can be dynamically probed at finite temperature, without requiring variation of the control parameter driving the quantum phase transition.

Prof Michael Kastner is an Extraordinary Professor in the Department of Physics at Stellenbosch University.

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