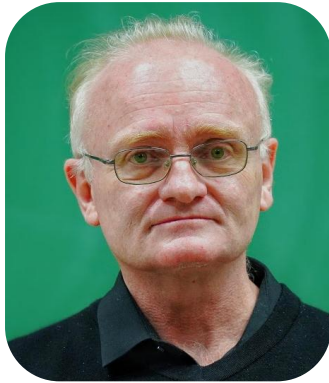


S E M I N A R



Robert de Mello Koch
(Huzhou University, China)

Date:

Monday, 4 August 2025

Time:

13h15-14h15 SAST

Venues:

- P213, Physics Building, East Campus, WITS
- Online

Who should attend?

All are welcome!

Enquiries:

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The structure of the space of gauge invariant operators at finite N

ABSTRACT:

The space of invariants for a single matrix is generated by traces containing at most N matrices per trace. We extend this analysis to multi-matrix models at finite N. Using the Molien-Weyl formula, we compute partition functions for various multi-matrix models at different N and interpret them through trace relations. This allows us to identify a complete set of invariants, naturally divided into two distinct classes: primary and secondary. The full invariant ring of the multi-matrix model is reconstructed via the Hironaka decomposition, where primary invariants act freely, while secondary invariants satisfy quadratic relations. Significantly, while traces with at most matrices are always present, we also find invariants involving more than N matrices per trace. The primary invariants correspond to perturbative degrees of freedom, whereas the secondary invariants emerge as non-trivial background structures. The number of primary invariants can be computed by performing a complete gauge fixing, which identifies the number of independent physical degrees of freedom. By comparing the Molien-Weyl partition function to a complementary counting based on the restricted Schur polynomial basis we argue that the number of secondary invariants must exhibit exponential growth of the form e^{cN^2} at large N, with c a constant.

Robert de Mello Koch is a Professor of Theoretical Physics at Huzhou University, China.

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