Mathematical Physics

Group Leader

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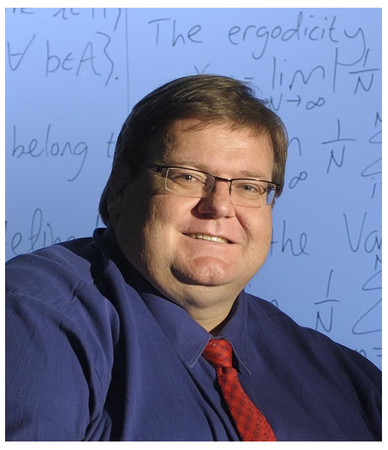
Group Members



Prof. Anton Ströh
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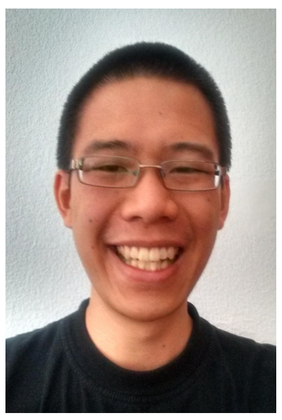

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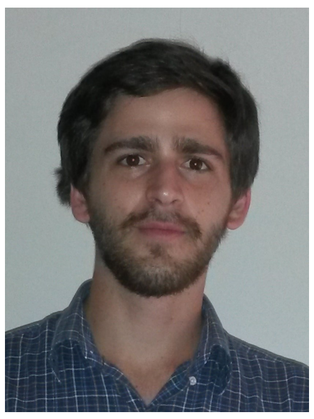
Department of Mathematics

Kyle Oerder
Department of Physics

Samuel Skosana
Department of Physics



Wernd van Staden
Department of Physics

Research Activities

Research activities of this group can be outlined as follows :

- Quantum dynamical systems: Mathematical structure and ergodic theory in an operator algebraic framework.
- Quantum spaces: Measure theory, topology and geometry in the quantum realm via operator algebras.

Collaboration

- International collaboration
  - Department of Mathematics, University of Rome “Tor Vergata”, Rome, Italy.
  - Department of Computational and Theoretical Sciences, Faculty of Science, International Islamic University of Malaysia, Pahang, Malaysia

Research Projects

- Joinings and subsystems of W*-dynamical systems.
- Free joinings of C*-dynamical systems.
- Ergodic theorems, and mixing, recurrence and balance properties of quantum dynamical systems, including applications and connections to quantum statistical mechanics.
- Noncommutative geometry.

- Honours, MSc and PhD projects:
  - The operator algebraic formulation of quantum physics.
  - Noncommutative ergodic theory and quantum statistical mechanics.
  - Quantum groups and their actions.
  - Noncommutative geometry.

What interests and experience do you need?

Background required up to Hons level:

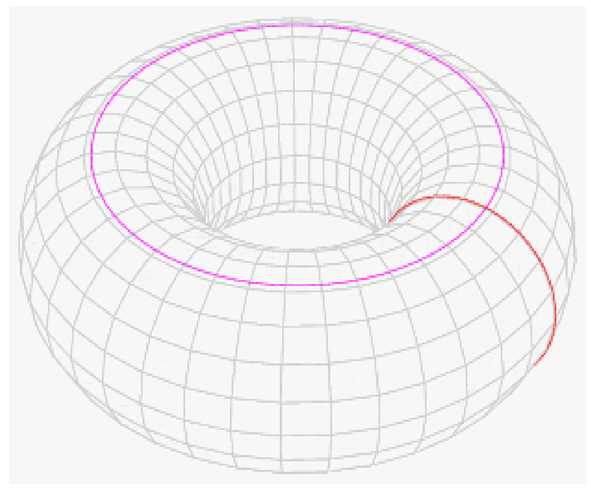
- Quantum mechanics, statistical physics.
- Undergraduate mathematics courses in Analysis and Abstract Algebra.

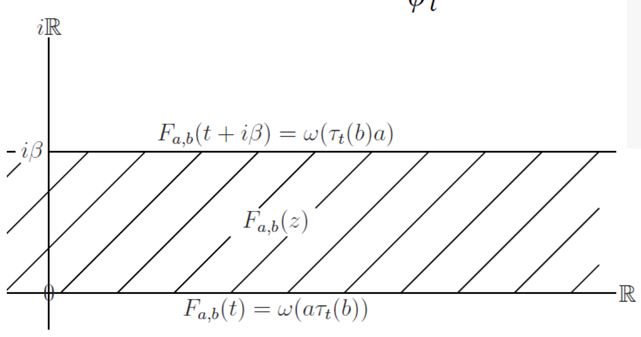
In addition, a strong background in, or willingness to study, the following mathematical topics: Functional Analysis, Topology, Measure Theory, and Operator Algebras.

Funding

- NRF
- NITheP

$$\begin{array}{ccc} A_\iota & \xrightarrow{\psi_\iota} & A \\ \alpha_\iota^g \downarrow & & \downarrow \alpha^g \\ A_\iota & \xrightarrow[\psi_\iota]{} & A \end{array}$$





$$U^g \pi(a) \Omega = \pi\left(\alpha^g(a)\right) \Omega$$

Recent Publications

Disjointness of C*-dynamical systems. Houston J. Math. 42 (2016), no. 1, 223-247
Detailed balance and entanglement. J. Phys. A 48 (2015), 155303, 17 pp.
Noncommutative Ricci flow in a matrix geometry. J. Phys. A 47 (2014), 045203, 13 pp.
Relative ergodic properties of C*-dynamical systems. Infin. Dimens. Anal. Quantum Probab. Relat. Top. 17 (2014), no. 1, 1450005, 26 pp.
Relatively independent joinings and subsystems of W*-dynamical systems Studia Math. 209 (2012), no. 1, 21-41
Ergodicity and mixing of W*-dynamical systems in terms of joinings Illinois J. Math. 54 (2010), no. 2, 543-566
Free joinings of C*-dynamical systems J. Math. Anal. Appl. 368 (2010), no. 2, 413-419
The Szemerédi property in ergodic W*-dynamical systems J. Operator Theory 64 (2010), no. 1, 35-67

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