



**S N BOSE NATIONAL CENTRE  
FOR BASIC SCIENCES**

*Block JD, Sector III, Salt Lake, Kolkata 700 106*

## **DEPARTMENTAL SEMINAR**

# **Physics of Complex Systems**

**01<sup>st</sup> December, 2023**

**11.30 AM**

**ONLINE / FERMION**

### **SPEAKER**

**Prof. Christian Maes,  
Professor, Department of Physics and Astronomy,  
KU Leuven**

### **TITLE OF THE TALK**

# **The Sun within: heat engines from active particle models**

### **ABSTRACT**

Motivated by (1) the absence of a clear detailed balance reference for standard active particle models, and (2) the conundrum of "hot spots" in biological systems, we propose an embedding of those active particle models in terms of two-temperature processes. One temperature refers to an ambient thermal bath, and the other temperature effectively describes systems with few degrees of freedom showing important population homogenization or even inversion of energy levels as a result of activation. That setup allows to quantitatively specify the resulting nonequilibrium driving, useful in particular for bringing the notion of heat into play, and making easy contact with thermodynamic features. Finally, we observe that the shape transition in the steady low-temperature behavior of run-and-tumble particles (with the interesting emergence of edge states at high persistence) is stable and occurs for all temperature differences, including close-to-equilibrium.

(Faezeh Khodabandehlou and Christian Maes, Department of Physics and Astronomy, KU Leuven -- arXiv:2310.14059v2 [cond-mat.stat-mech])

### **HOST FACULTY**

**Dr. Urna Basu, Assistant Professor**  
**DEPT. OF PHYSICS OF COMPLEX SYSTEMS**

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