NOBEL SYMPOSIA SERIES

The Mystery of Black Hole Entropy

Professor Erik Aurell

Professor of Theoretical Biological Physics at
Royal Institute of Technology at Stockholm (KTH)

NOBEL IN AFRICA
A STIAS INITIATIVE

Thursday, 20 October | 18:00-19:30
Room 1005 Maths/Industrial Psychology Building, Stellenbosch University

BIOGRAPHY

Professor Aurell started his scientific career as a mathematical physicist, receiving his PhD at Goteborg University in Sweden in 1989, and did a postdoc 1989-90 at the Observatoire de Nice, France. He has held the chair of Theorical Biological Physics at KTH since 2003. Previous positions include Finland Distinguished Professor at the Academy of Finland (2008-2013) and shorter guest professorships in Finland, China and France. Since 2021, he has served as a Board Member of European Physical Society Statistical and Nonlinear Physics Division.

Aurell has worked on nonlinear dynamics, turbulence models, biological physics/systems biology and related inference problems, stochastic thermodynamics and open quantum systems.

ABSTRACT

In statistical mechanics entropy is a measure of disorder obeying Boltzmann's formula $S = \log N$, where N is the accessible phase space volume. In black hole thermodynamics one associates to a black hole a (Bekenstein-Hawking) entropy S_{BH}. It is well known that S_{BH} is very large for astrophysical black holes, much larger than any collection of material objects that could have given rise to the black hole. If S_{BH} is an entropy the question is thus what is the corresponding N, and how come this very large phase space volume is only opened up to the universe by a gravitational collapse.

I will discuss these issues from the viewpoint of statistical mechanics, and of the still active discussion on the meaning of thermodynamic entropy. I will also discuss recent results with Pawel Horodecki and Mikhail Eckstein on Hawking radiation and the quantum marginal problem (Aurell, Eckstein & Horodecki, JCAP 2022).

REGISTER

https://airtable.com/shrBp9xFfBIVP3JXL

Nobel in Africa is a STIAS Initiative in partnership with Stellenbosch University, under the auspices of the Nobel Foundation and the Royal Swedish Academy of Sciences with funding from the Knut & Alice Wallenberg Foundation. These Public Lectures are organised as part of the Nobel Symposium in Physics on Predictability in Science in the Age of Artificial Intelligence, the first in the Nobel in Africa – NOBEL SYMPOSIA Series.

Stellenbosch UNIVERSITY IYUNIVESITHI UNIVERSITEIT

NITheCS National Institute for Theoretical and Computational Sciences

stias STELLENBOSCH INSTITUTE FOR ADVANCED STUDY STELLENBOSSE INSTITUUT VIR GEVORDERDE NAVORSING