

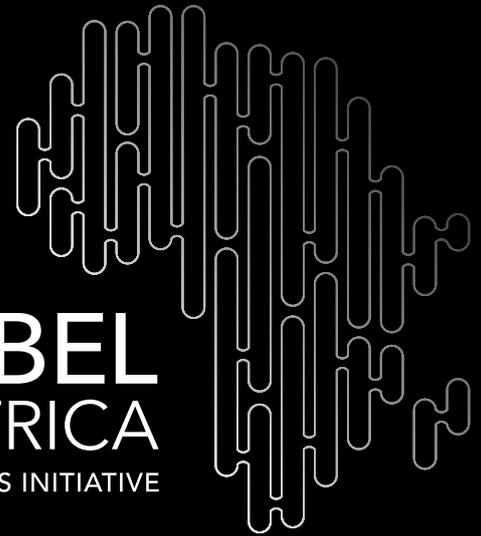
NOBEL SYMPOSIA SERIES

The Mystery of Black Hole Entropy

Professor Erik Aurell

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

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Thursday, 20 October | 18:00-19:30
Lower Seminar Room, Mathematics 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 Theoretical 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).

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