Title: Preparation Noncontextuality and Continuous Transformations of Quantum Systems

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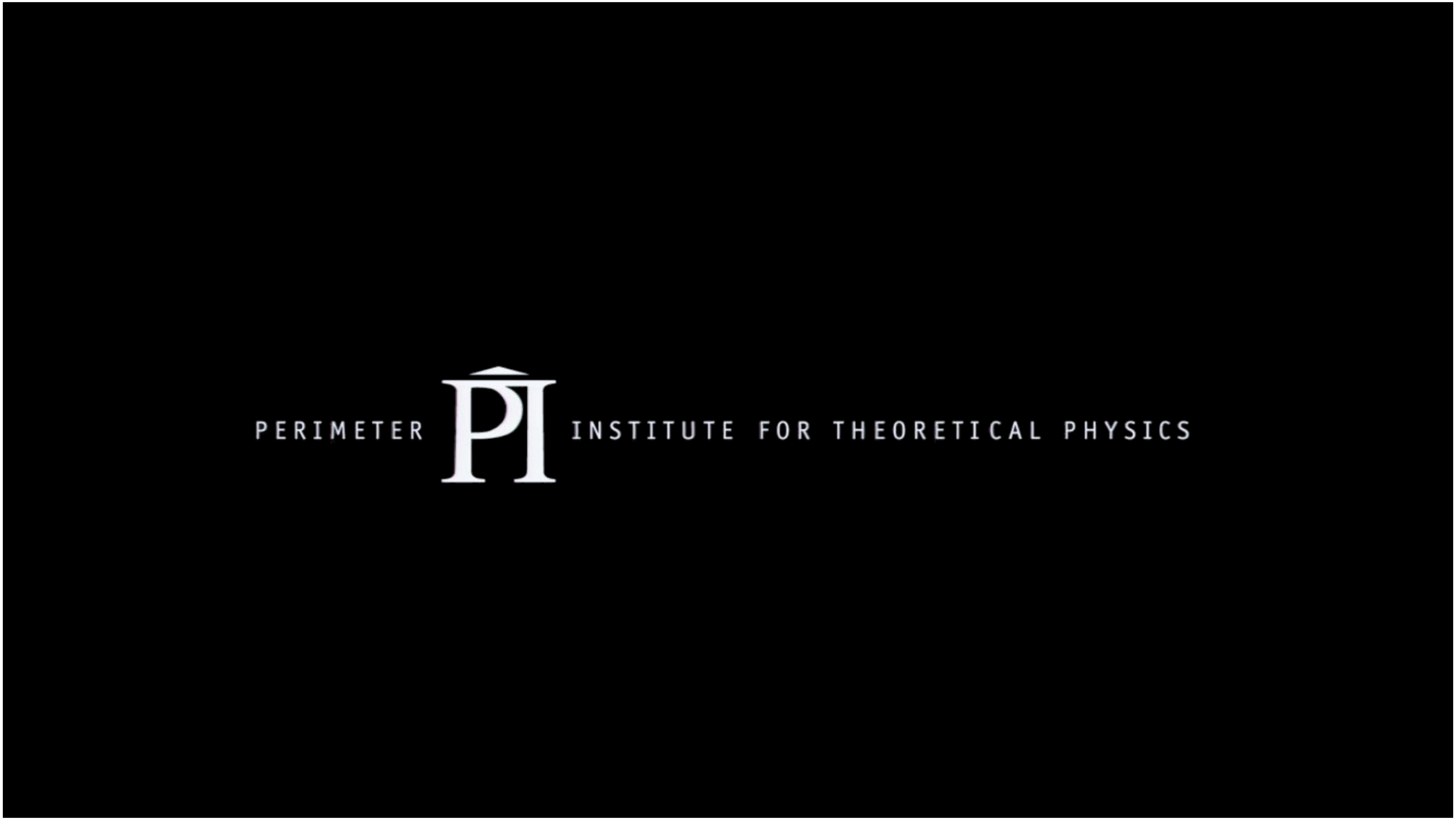
Abstract:
Traditionally, the focus on determining characteristic properties of quantum mechanics has been on properties such as entanglement. However, entanglement is a property of multiple systems. Another interesting question is to ask what properties are characteristic of single quantum systems. Two answers to this question are:

1.There is a continuous path of pure quantum states connecting any two quantum states [1], and,

2.Quantum mechanics is preparation noncontextual [2].

In this talk, I will discuss a link between these two answers to this question. In particular, I will establish some strict upper bounds on the maximum size of the set of quantum states that can be modelled in a preparation noncontextual, nonnegative theory and show that this set contains pure states that cannot be connected to any other pure state in the set. I will also discuss a common example of a preparation noncontextual model that allows negative values, namely, a discrete Wigner function, and establish necessary and sufficient conditions for bases of an arbitrary dimensional Hilbert space to have nonnegative Wigner functions, i.e., to admit a classical model. I will conclude with a discussion of some open problems.
[1] L. Hardy, quant-ph/0101012v4 (2001).
[2] R. W. Spekkens, Phys. Rev. A, 71, 052108 (2005)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