

# MATHEMATICS COLLOQUIUM

## *The Mathematics of Quantum Entanglement*

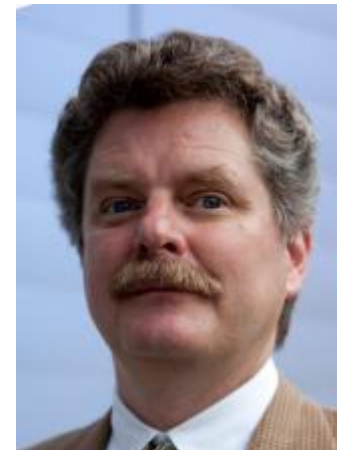
The laws of quantum mechanics for systems of finitely many degrees of freedom can be expressed in terms of linear algebra. Although they are simple and clear enough, as is well-known, the laws of quantum mechanics lead to seemingly paradoxical predictions for experimental results. The 2022 Nobel Prize in physics was awarded to three physicists who verified such predictions. Many of these paradoxical predictions have to do with "entanglement", a term due to Schoedinger, who identified it in a 1935 paper as "not one, but the, feature" setting quantum mechanics apart from classical mechanics. He began the mathematical investigation of entanglement making use of the Singular Value Decomposition. The subject took on new life in the 1990's when researchers began to ask how this strange and beautiful quantum behavior could be put to use for quantum computing and quantum communication. The strange predictions of quantum theory are a source of new questions in linear algebra, and consequently new theorems and new open problems. Several of these will be presented. The talk is intended to be clearly understandable to anyone with a good knowledge of linear algebra. No prior familiarity with quantum theory will be assumed.

TUESDAY

SEPTEMBER

17

4:30 - 5:30PM  
LECONTE COLLEGE  
ROOM 444



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