

# APPLIED MATHEMATICS COLLOQUIUM

Date: Wednesday, October 7, 2015

Time: 2:30 – 3:30 p.m.

Location: Middlesex College Room 204

## **From physical principles to quantum theory and beyond**

**Dr. Markus Mueller**

Department of Applied Mathematics,  
Western University

### **Abstract:**

In the last few years, it has become clear that quantum theory is just one possible probabilistic theory among many others. This research, rooted in quantum information theory, has shown that physics could potentially behave very differently, predicting different kinds of correlations or interference patterns. In the talk, I will focus on two aspects of this research. First, I will show how one can derive the Hilbert space formalism of quantum theory from some simple information-theoretic principles. Second, this new perspective will make it clear that the structure of quantum mechanics is tightly linked to the structure of spacetime in several surprising ways. I will show how this point of view is supported by mathematical theorems, and demonstrate a particular result that relates the number of degrees of freedom of a quantum bit to relativity of simultaneity on an interferometer.