



University of Crete  
Department of Physics

## *Physics Colloquium*

Thursday, 13 March 2025 | 17:00 – 18:00, Seminar Room 3<sup>rd</sup> Floor

### **Towards experimental observation of entanglement in a quantum many-body system**

**Prof. Spyros Sotiriadis**

*University of Crete & FORTH*

#### **ABSTRACT**

Entanglement, a fundamental phenomenon in quantum physics, plays a crucial role in many-body systems, distinguishing quantum phases of matter, underlying the mechanism of thermalisation and determining the complexity of classical simulations. While entanglement has been observed in few-body experiments, its detection in many-body systems remains challenging as it requires full reconstruction of the quantum many-body state from measurements. In this talk, I will present a quantum state tomography technique that allows direct measurement of the von Neumann entropy, a key quantity for detecting entanglement in pure quantum states. By applying this method to a class of ultracold atom experiments, we verify theoretical predictions for the scaling of the von Neumann entropy in both thermal equilibrium and out-of-equilibrium dynamics.