Simposio de Tecnologías Cuánticas

Quantum Technologies Symposium

Madrid, 21 y 22 de noviembre de 2018 / November 21-22 2018

ABSTRACT

Controlling and Exploring Quantum Matter Using Ultracold Atoms in Optical Lattices

Immanuel Bloch

More than 30 years ago, Richard Feynman outlined the visionary concept of a quantum simulator for carrying out complex physics calculations. Today, his dream has become a reality in laboratories around the world. In my talk I will focus on the remarkable opportunities offered by ultracold quantum gases trapped in optical lattices to address fundamental physics questions ranging from condensed matter physics over statistical physics to high energy physics with table-top experiment. For example, I will show how it has now become possible to image and control quantum matter with single atom sensitivity and single site resolution, thereby allowing one to directly image individual quantum fluctuations of a many-body system or directly reveal antiferromagnetic and topological order in the fermionic Hubbard model. Finally, I will discuss our recent experiments on novel many-body localised states of matter that challenge our understanding of the connection between statistical physics and quantum mechanics at a fundamental level.