



The Abdus Salam
International Centre for Theoretical Physics



**Advanced Workshop on
"Anderson Localization, Nonlinearity and
Turbulence: A Cross-Fertilization"**

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TITLE:

"Ultracold atoms in *disordered* optical lattices: Anderson localization and beyond"

ABSTRACT:

Ultracold atoms are excellent systems to quantum-simulate the physics of ideal condensed-matter systems. A fundamental tool for this investigation is represented by optical lattices, i.e. periodic potentials generated by laser standing waves. Quantum phase transitions can be induced and investigated thanks to the possibility of accurately tuning the interactions between the particles, their mobility in the lattice, the amount of disorder and the system dimensionality. We will review some of the recent developments achieved at LENS in this field by studying ultra-cold quantum gases and mixtures in optical lattices. They include Anderson localization, interplay disorder-interactions, de-localization, new diagnostic tools.