Cold atoms in optical lattices and the physics of strong quantum correlations

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Résumé

"Artificial crystals” made of ultra-cold atoms trapped by laser beams can be engineered with a remarkable level of controllability, and allow for the study of quantum physics in previously unexplored regimes, hence opening up new frontiers between condensed matter physics and quantum optics. I will review various aspects of this field, including the trapping, cooling and probing of fermionic atoms into the Mott and Néel states. I will also address recent theoretical and experimental studies of transport in such systems.