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## QUANTUM SIMULATION WITH COLD ATOMS AND IONS

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Trapped ultracold atoms and ions in electromagnetic traps have been so far studied separately, but in the last few years the technological progress in trapping and cooling has enabled experimental physicists to combine these systems in order to investigate new physics. In particular, such hybrid systems allow investigating condensed-matter systems more closely: for instance, an important component of a solid-state system is the charge-phonon coupling, which is mimicked naturally in an atom-ion system.

In my talk I shall report on recent theoretical investigations concerning the hybrid atom-ion system. In particular, I shall present how such a system can be used in order to simulate solid-state physics and how atom-ion entanglement can be generated.