

## Quantum Magnetism with Trapped Ions

*mercredi 15 juin 2016 09:30 (45 minutes)*

rapped atomic ions represent a very clean platform for the quantum simulation of interacting spin models. When spin-dependent optical dipole forces are applied to a collection of trapped ions, an effective long-range quantum magnetic interaction arises, with reconfigurable and tunable graphs that are determined by the spectrum of the laser forces. Recent experiments have implemented transverse Ising or XY models with up to 20 trapped ions, and this seminar will cover recent experimental results, from studies of equilibrium ground states [1,2], dynamics [3,4], and manybody localization [5] to the implementation of certain interacting spin-1 models [6] that may show certain topologically-ordered ground states. Soon these experiments will be extended to  $>20$  spins, where no classical computer can predict its behavior, particularly the many-body dynamics. Such results are expected to shed light on the behavior of spin-liquids and other interesting forms of magnetism that feature frustration and massive entanglement.

[1] R. Islam, et al., Science 340, 583 (2013).

[2] P. Richerme, et al., Phys. Rev. Lett. 111, 100506 (2013).

[3] P. Richerme, et al., Nature 511, 198 (2014).

[4] C. Senko, et al., Science 345, 430 (2014).

[5] J. Smith, et al., arXiv 1508.07026 (to appear in Nature Physics, 2016).

[6] C. Senko, et al., Phys. Rev. X 5, 021026 (2015).

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**Classification de Session:** Morning Session1