

**IQ4: Antoine Browaeys** (Institut Optique Saclay) 3h

“Many-body physics and quantum information with arrays of Rydberg atoms”

These three lectures will present how individual atoms trapped in tweezer arrays and excited to Rydberg states can be used to perform quantum simulations of many-body Hamiltonians and for quantum information tasks. This system naturally implements various spin models, such as the XY or quantum Ising ones commonly studied in condensed matter physics. The lectures will start by a tutorial on interactions between atoms in general followed by a description of the trapping of individual atoms in arrays of tweezers. We will then introduce the basic concepts of Rydberg physics and why interacting Rydberg atoms are useful for quantum simulation or computation tasks. Finally, we will discuss several recent experiments simulating quantum magnetism, including in out-of-equilibrium situations, or implementing topological situations with this platform.