QM2: **Philippe Mendels** (Laboratoire de Physique des Solides – Université Paris Saclay) 2h

" Quantum Spin Liquids : an experimental overview”

(Re-)triggered by the discovery of High Temperature Superconductivity in cuprates, the field of quantum spin liquids (QSL) in dimension higher than one has been constantly developing over the last 30 years. After introducing the main concepts and the underpinning exotic physics (fractionalization, entangled ground state, effective spin models, emergent quasiparticles…), I’ll tentatively sketch a state of the art in the realization of such physics in the realm of materials where geometric frustration plays a crucial role.
The field has been marked by the discovery of S=1/2 herbertsmithite $ZnCu_3(OH)_6Cl_2$ where Cu^{2+} ions decorate a kagome lattice with dominant first nearest -neighbour interactions. Altogether with the other kagome variants (barlowite, kapellasites, …) it represents one of the most studied branches with well-established experimental signatures of a QSL ground state on the kagome lattice. The impact on the experimental properties of light disorder or small deviations to the ideal Heisenberg hamiltonian and the relevance of such materials to the still debated ground state of the near neighbour Heisenberg model will be addressed.
The Kitaev model, where bond-dependent frustrated Ising interactions between spins 1/2 on a honeycomb lattice lead to an exact solution, also realizes a QSL ground state. The search for a material as close as possible to the QSL ground state has led to several classes of candidate materials with, e.g. the opportunity to approach the narrow QSL region in the phase diagram using external parameters (field, pressure) in $RuCl_3$. The case of Iridates will also be discussed.
Finally, other tracks have been recently explored using rare-earth atoms where effective spin models are at work on the pyrochlore or triangular lattices. In the latter circumventing the impact of strong disorder seems a major challenge while low energy effective models on the pyrochlore lattice, especially in the Ce-based family, are currently under focus as they might lead to original and unique/specific emergent electromagnetic excitations.