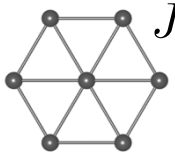
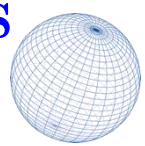
Mourigal Lab Research: Quantum Magnetism

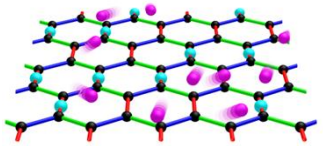
Idea

magnetic material

$\Leftrightarrow$ $\mathcal{H} = \sum_{(ij)} \hat{\mathbf{S}}_i J_{ij} \hat{\mathbf{S}}_j$ Heisenberg model

$\Leftrightarrow$  J_{ij} $\otimes$  $\hat{\mathbf{S}}$

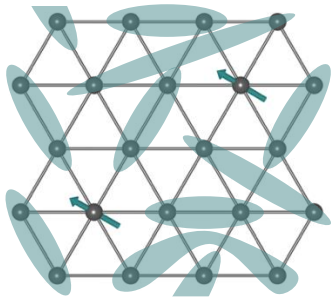
lattice-space spin-space

$\Leftrightarrow$ 

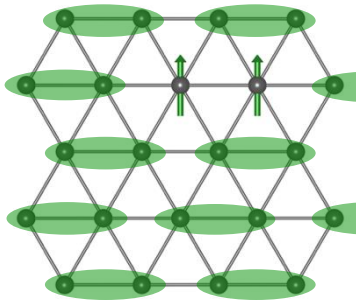
emergent quantum behavior

Challenge

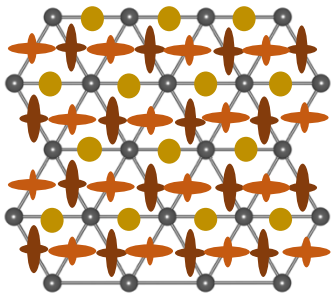
topological order — entanglement — local order — disorder



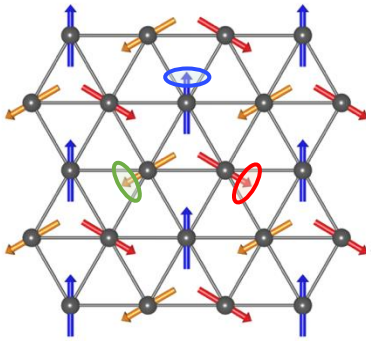
Quantum spin liquid



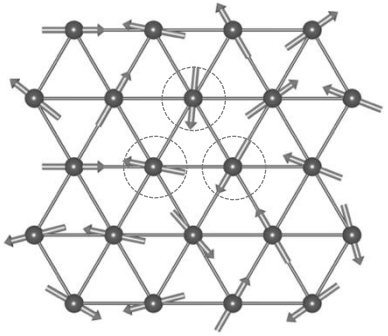
Quantum paramagnet



Quadrupolar order

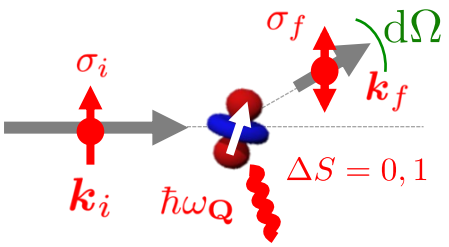


Dipolar order

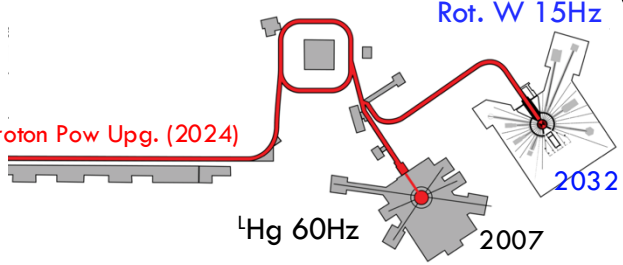


Paramagnet

Approach

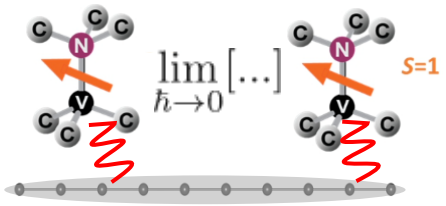


Inelastic neutron scattering



ORNL Spallation Neutron Source

Applications?



Transduction of quantum information