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Dipolar-Octupolar Quantum Spin Liquids in Ce-based Pyrochlores

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In geometrically-frustrated Ce-based pyrochlores, such as $Ce_2Zr_2O_7$, the effective S=1/2 of the Ce3+ crystal field ground state doublet is known to act both as a conventional dipole magnetic moment, and as an octupole. This constrains the form of its near-neighbour Hamiltonian, and allows for different ordered or quantum disordered ground states in this family of materials, where either the dipolar or octupolar nature of the S=1/2 degree of freedom dominates. I will describe recent experiments [1,2], mostly neutron scattering and heat capacity, which show how the nature of the Ce3+ ground state doublet can be revealed, and how a particular form of quantum spin liquid can be identified as the likely ground state in $Ce_2Zr_2O_7$.

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