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Neutron scattering studies of magnetic pyrochlores

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The pyrochlore antiferromagnets in which spins interact in a network of corner-sharing tetrahedra have macroscopic ground state degeneracy, that leads to exotic low temperature properties. Spinels AB_2O_4 realize the pyrochlore lattice if the B ions couple antiferromagnetically. This talk will start with a quick review of several novel properties found in spinels, such as the spin liquid state in $ZnCr_2O_4$, the 3D spin-Peierls transition in $ZnCr_2O_4$, the spin-orbital coupling in ZnV_2O_4, and the heavy fermionic behaviors in LiV_2O_4. A discussion will follow on our recent neutron and X-ray scattering works on ACr_2O_4 (A=Cd, Hg). We will show that the 3D spin-Peierls transition in $CdCr_2O_4$ is different from that observed in $ZnCr_2O_4$, and that the magnetic field-induced half-magnetization plateau state in $HgCr_2O_4$ has the $P4_332$ symmetry. Our results provide direct tests of theoretical models proposed to understand the complex behaviors of the Heisenberg pyrochlore antiferromagnets. A quantum spin pyrochlore system will also be discussed.