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**Valence Bond Crystal on the Hyperkagome Antiferromagnet** EMIL BERGHOLTZ, ANDREAS LAUCHLI, RODERICH MOESSNER, Max Planck Institute for the Physics of Complex Systems — We describe our recent work that indicates that the ground state of the antiferromagnetic spin-1/2 Heisenberg model on the highly frustrated, three-dimensional, hyper-kagome lattice is a valence bond crystal (VBC). Performing a series expansion around an arbitrary dimer covering on the hyper-kagome we find that a ground state with a huge (72 site) unit cell is selected by the quantum fluctuations. The regularity and favorable energetics of our series expansion establishes the VBC as a serious contender to the earlier spin liquid proposals. We find that the ground state supports many, very low lying, excitations in the singlet sector and that the low energy spinful excitations (spinons and triplons) are effectively confined to various emergent lower-dimensional structures. If applicable to the recently studied sodium iridate compound, $Na_4Ir_3O_8$, this scenario has interesting observable implications, such as spatially anisotropic neutron scattering spectra and possibly multiple finite temperature signatures in the magnetic specific heat due to a multi-step breaking of discrete symmetries. Most saliently, here—as for several proposed states for analogous kagome and pyrochlore magnets—one might expect a clearly resolved Ising transition at relatively high temperature.

Ref: E.J. Bergholtz, A.M. Läuchli and R. Moessner, Phys. Rev. Lett., in press (2010) [arXiv:1010.1345]

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