Spin nematics in pyrochlore antiferromagnet with ferromagnetic next-nearest-neighbor interaction\textsuperscript{1} GIA-WEI CHERN, OLEG TCHERNYSHYOV, Johns Hopkins University — The classical Heisenberg antiferromagnet on the pyrochlore lattice remains disordered down to zero temperature. A weak ferromagnetic interaction between second neighbors $J_2$ leads to a discontinuous ordering at a temperature $T_c \sim |J_2|$. Below the transition, a spin order with an extended unit cell containing as many as 1024 spins was found in Monte-Carlo simulations for $J_2 = -0.1 J_1$ \textsuperscript{[1]}. Here we present the characterization of ordered states at a smaller $J_2 = -0.01 J_1$. This time the magnet shows a layered structure in the ordered phase: tetrahedra of the same layer develop a collinear Néel order with an in-plane wavevector $q = 2\pi (1, 1)$. At the mean-field level, each different layer has its own preferred spin direction. Thermal fluctuations, however, favor a collinear alignment of spins in different layers. There still remains a $Z_2$ symmetry for each layer: the Néel vector of a plane can be parallel or antiparallel to the common preferred direction, rendering the magnet a spin nematic, possibly with an additional bond order. \textsuperscript{[1]} D. Tsuneishi, M. Ioki, and H. Kawamura, J. Phys. Condens. Matter, to be published; cond-mat/0609655.

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