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A Disordered Route to the Coulomb Quantum Spin Liquid: Random Transverse Fields on Spin Ice in Pr2Zr2O7[1] JIAJIA WEN, SIMES, Stanford University; IQM, JHU, SEYED KOOHPAYEH, IQM, JHU, KATE ROSS, IQM, JHU; NCNR, NIST, BENJAMIN TRUMP, TYREL MCQUEEN, IQM and Dept of Chemistry, JHU, KENTA KIMURA, SATORU NAKATSUJI, ISSP, University of Tokyo, YIMING QIU, DANIEL PAJEROWSKI, JOHN COPLEY, NCNR, NIST, COLLIN BROHOLM, IQM, JHU; NCNR, NIST — Inelastic neutron scattering reveals a broad continuum of excitations in $Pr_2Zr_2O_7$, the temperature and magnetic field dependence of which indicate a continuous distribution of quenched transverse fields (Δ) acting on the non-Kramers Pr^{3+} crystal field ground state doublets. We show the magnetic excitations in $Pr_2Zr_2O_7$ are composed of two parts: a lower energy regime that is driven by inter-spin correlations, and a momentum transfer independent higher energy part driven by quenched transverse fields. A random phase approximation provides an excellent account of the data with a transverse field distribution $\rho(\Delta) \propto (\Delta^2 + \Gamma^2)^{-1}$ where $\Gamma = 0.28(1)$ meV. Established during high temperature synthesis due to an underlying structural instability, it appears disorder in $Pr_2Zr_2O_7$ actually induces a quantum spin liquid.

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