Abstract Submitted
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Magnetic Frustration from Nonuniform g-factors[1] WEIGUO YIN, Brookhaven National Laboratory — Frustrated magnets are commonly known as materials in which localized magnetic moments, or spins, interact through competing exchange interactions that cannot be simultaneously satisfied. Here we show that even when the exchange interactions are fully cooperative, magnetic frustration can be induced by nonuniform Landé g factors, leading to a mutual interplay of typical ferromagnetic (FM) and antiferromagnetic (AF) features. This novel physics—exactly demonstrated in the one-dimensional Ising model with alternating g factors [1]—provides new insight into the puzzling phenomenon that the magnetic susceptibility of many AF or FM materials is FM-like at low temperature but AF-like at high temperature. Furthermore, we found a unique magnetic-field-driven quantum critical point at which one half of the spins are frozen into a complete order and the other half are fully disordered. The present theory joins the recent intensive search for frustrated magnets beyond the "standard model" of condensed matter physics. It could broaden our understanding and design of exotic magnetic behaviors such as spin ice, spin glass, and spin liquid that are essential to quantum computing, spintronics, and high-temperature superconductivity. [1] W.-G. Yin and C. R. Roth, arXiv:1510.00030.

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