Abstract Submitted
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Improper electric polarization in perovskite oxides with two magnetic sublattices[1] JORGE INIGUEZ, HONG JIAN ZHAO, Luxembourg Institute of Science and Technology, XIANG MING CHEN, Zhejiang University, LAURENT BELLAICHE, University of Arkansas — I will discuss the sources of magnetically-driven ferroelectric order in ABO_3 perovskite oxides with magnetic A and B cations that order in simple, short-period spin structures. I will focus on the families of rare-earth orthoferrites and orthochromites, which are currently receiving much attention because of their multiferroic and fast spin dynamics properties. Our first-principles calculations reveal that the largest effects correspond to collinear spin configurations and are driven by non-relativistic exchange-strictive mechanisms. Our simulations allow us to determine the dominant magnetostructural couplings underlying the observed improper ferroelectricity, including a striking magnetically-driven piezoelectric effect. Further, I will show it is possible to derive phenomenological and atomistic theories that describe such couplings in a generic perovskite lattice; this allows us to predict how the observed multiferroic effects can be enhanced, and even how similar ones can be obtained in other perovskite families. Our results thus highlight perovskites with two magnetic sublattices as a rich playground for novel magnetoelectric effects. [Nat. Comms. (in press)]

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