

Improper orders in nonsymmorphic systems

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The study of improper phases in the context of multiferroic materials has a long history. In this talk, I highlight an overlooked mechanism that couples order parameter bilinears to odd-parity order parameters such that the latter emerge as improper orders. For that, we explore a novel perspective of nonsymmorphic symmetries based on extended symmetry groups in real space. We highlight how nonsymmorphic symmetries can generate rather nonintuitive couplings between order parameters. We are inspired by the phenomenology of the recently discovered superconductor CeRhAs, but our results also have implications for other primary orders. In particular, we find that a bilinear in the superconducting order parameter can couple linearly to odd-parity orders in centrosymmetric systems. Our findings open the door for exploring nonsymmorphic symmetries in the broader context of improper orders with potential applications to topological functional materials.

[1] <https://arxiv.org/abs/2309.05664>.