“Topology and Emergent Phenomena of Domain Walls in Complex Materials.”

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Ordering of charge/spin/orbital degrees of freedom in complex materials accompanies domains and domain walls associated with the directional variants ($Z_m$) and also antiphases ($Z_n$). It has been recently realized that nontrivial $Z_m \times Z_n$ topology can exists in large-scale real-space configurations of domains and domains walls of complex materials. Furthermore, the vertices where domain walls merge can be considered as topological defects with well-defined vorticities ($Z_l$ vortices). We will discuss the recently-discovered examples of $Z_m \times Z_n$ domains and $Z_l$ vortices in complex materials. We also discuss emergent physical properties of domain walls, which are distinctly different from those of domains.