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## Abstract

### Glass transitions and glass phases

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Spin glasses are magnetic systems in which the interactions between magnetic moments are in conflict with each other, due to frozen-in disorder. This suppresses conventional long range order and, instead leads to a complex ordered state at low temperature with many unusual properties: The resulting 'glass' has no obvious order parameter or simple symmetry breaking pattern. Unlike simple ordering magnets, spin glasses are characterized by a large number of metastable low temperature phases which they can freeze into, reflecting (and memorizing) details of the experimental protocol. This complex structure of phase space has remarkable consequences on the dynamical properties and the response of glasses.

These hallmarks are shared by many other complex systems where interactions and disorder strongly compete. The common denominator is the strong divergence of relaxation times and the eventual breakdown of ergodicity, which emphasizes the ultimately dynamical nature of glass transitions. We will discuss both classical and quantum mechanisms, that lead to such freezing transitions.