Emergence of hidden order and its dynamical evolution in the annealed Sherrington-Kirkpatrick model

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The concept of the hidden Mattis phase in annealed spin-glass models was first proposed by Kasai and Okiji 40 years ago [1], but it received little attention until recently. Although no thermodynamic transition is expected, the distribution of spin configurations acquires a Mattis-type order at low temperatures, associated with gap opening at the leading edge of the coupling matrix spectrum[2]. In this talk, I will discuss the dynamic consequences of the hidden Mattis order based on detailed numerical and analytical studies of the Sherrington-Kirkpatrick (SK) Ising spin-glass model with slowly evolving coupling constants[3]. Temporal evolution of spin autocorrelations is shown to follow a two-step process: at short times, spins equilibrate around a fixed principal eigenvector that defines the backbone of the spin condensate; the slow evolution of the coupling constants, on the other hand, yields diffusive motion of the eigenvectors and intermittent hybridization of states upon gap closures. Adapting the Dyson's seminal work[4] to the present case, we show that the finite-size scaling properties of the gap dynamics can be derived analytically. Our work adds to the converging views in the past few years towards the glass transition in supercooled liquids.

References

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