Temperature chaos

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The Gibbs measure of many disordered systems at low temperature may exhibit a very strong dependance on even tiny variations of temperature, usually called "temperature chaos". I will discuss this question for Spin Glasses. I will report on a recent work with Eliran Subag (Courant) and Ofer Zeitouni (Weizmann and Courant), where we show temperature chaos for a general class of spherical Spin Glasses at very low temperature. This question has a very long past in the physics literature, and an interesting recent history in mathematics. Indeed, in 2015, Eliran Subag has given a very sharp description of the Gibbs measure for pure p-spin spherical Spin Glasses at low temperature, building on results on the complexity of these spin glasses by Auffinger-Cerny and myself. This description (close to the so-called Thouless-Anderson-Palmer picture) excludes the existence of temperature chaos for the pure p-spin! Our recent work shows that this behavior for the pure p-spin is very singular.

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