

Stochastic resonance - amplification of a signal through noise

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Stochastic resonance is a phenomenon which was theoretically proposed in 1980s in the context of climate dynamics in order to explain the period of earth ice ages. On a general level, it can be summarized as follows: in a bistable system subject to both random fluctuations and a weak periodic perturbation, the system response becomes synchronized to the external drive. Interestingly, the synchronization is completely absent if noise is not included in the system. Noise therefore acts in a counterintuitive way as a mean of amplifying a signal rather than destroying it. Since its discovery, stochastic resonance has been further studied theoretically and experimentally found in many different types of systems, from electronic and superconducting circuits to laser apparatuses and also biological systems, in particular neurons. In this talk I will firstly give a review of the phenomenon, its history and its features. Secondly, I will explain a recent study of stochastic resonance in a model of quantum matter, which highlights the possibility of find it and exploit it to investigate disordered phases of solids.