Resonant delocalization: the phase diagram of the Anderson model on trees

Simone Warzel

Motivated by the quest for a theory of quantum transport in disordered media, in 1958 P.W. Anderson came up with a model for a quantum particle in a random energy landscape. Among its interesting features is a conjectured sharp transition from a regime of localized eigenstates to one of diffusive transport. Until today it remains a mathematical challenge to establish these features in the framework of random Schrödinger operators. In this talk, I will describe recent progress in the understanding of the spectral and dynamical properties of such operators in case the underlying configuration space is hyperbolic such as a tree graph. Among the surprising phenomena which we discover is that even at weak disorder the regime of diffusive transport extends well beyond the one of the graph Laplacian into the regime of Lifshitz tails. As will be explained in the lecture, the mathematical mechanism for the appearance of conducting states in this non-perturbative regime are disorder-induced resonances.