A Novel Approach to Study Highly Correlated Nanostructures: The Logarithmic Discretization Embedded Cluster Approximation (LDECA).

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This talk will present a new approach to study transport properties of highly correlated local structures. The method, dubbed the Logarithmic Discretization Embedded Cluster Approximation (LDECA) [1], consists of diagonalizing a finite cluster containing the many-body terms of the Hamiltonian and embedding it into the rest of the system, combined with Wilson's idea of a logarithmic discretization of the representation of the Hamiltonian. The physics associated with both one embedded dot and a double-dot side-coupled to leads is discussed in detail. In the former case, the results perfectly agree with Bethe ansatz data, while in the latter, the physics obtained is framed in the conceptual background of a two-stage Kondo problem. In addition, a many-body formalism provides a solid theoretical foundation to the method. Results for other systems will also be presented and a new version of the method, where the Lanczos exact diagonalization step is replaced by a Density Matrix Renormalization Group (DMRG) procedure will be introduced.

[1] E. V. Anda et al., Phys. Rev. B 78, 085308 (2008).