Auxiliary systems for observables: the dynamical local connector approximation for electron addition and removal spectra

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Abstract: One–electron excitation spectra, as measured in direct and inverse photoemission experiments, constitute a remarkable source of information on the electronic structure of a system. In this talk I will present an innovative theoretical approach, the dynamical local connector approximation, for predicting and describing such spectra. The idea is based on designing two shortcuts to the standard method, which relies on complex, non–local self energies evaluated specifically for each material. The first one is the introduction of an auxiliary system that exactly targets, in principle, the excitation spectrum of the real system, via a local and frequency–dependent, yet real, potential, the spectral potential. The second shortcut consists in calculating this potential just once and forever in a model system, the homogeneous electron gas, tabulate the result and then import it in the actual calculation via a suitable connector. I will discuss the performances of such a strategy by considering exactly solvable models and prototypical real materials.