Many-body phenomena in correlated systems.

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By definition, correlated electrons cannot be reduced to a single-particle description. Indeed, the most successful theory of electronic correlations, Dynamical Mean-Field Theory (DMFT), essentially takes on-site electron-electron interaction in the account. However one can note that most of the DMFT calculations yield single-electron Green's function and related quantities, and not collective many-body excitations, like plasmons or magnons. We argue that such an asymmetry is related with a local nature of the DMFT theory. Whereas local single-electron self-energy appears to be a very reasonable approximation, an assumption about the locality of, for example, polarization operator violates the charge conservation law. Thus a conservative theory for many-body quantities should necessarily be non-local in space. We construct a minimal theory of this kind, that is based on the ladder series expansion in so-called dual variables. The results for plasmonic dispersion in correlated films are presented. Other related problems will be discussed also.