

Correlations and dynamical mean-field theory

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Strong correlations have been one of the key issues in the condensed matter physics. The main difficulty in the study of electron correlations is that even the simplified theoretical models, which include only a minimal number of essential degrees of freedom, are very challenging to solve. The advent of the dynamical mean-field theory has enabled a successful description of strongly correlated systems in a unified frame. Such a success was accomplished since the dynamical mean-field theory is able to fully include the local quantum dynamics.

Several extensions have also been developed for better description of spatial correlations which are treated in the mean-field level within the single-site dynamical mean-field theory. In this lecture, I will introduce central ideas of the dynamical mean-field theory and demonstrate several examples for its successful description of correlated phenomena. Current status of the research along this line will also be discussed.