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Farsightedness of the Correlation Energy in Polarizable Non-Metallic Nanostructures ALBERTO AMBROSETTI, Università degli Studi di Padova, NICOLA FERRI, Fritz-Haber Institut der Max Planck Gessellschaft, Berlin, ROBERT DISTASIO,JR., Princeton University, Princeton, ALEXANDRE TKATCHENKO, Fritz-Haber Institut der Max Planck Gessellschaft, Berlin — The success of semi-local approaches to the electron correlation energy is commonly attributed to the relative *nearsightedness* of the electronic matter–a powerful concept introduced by Walter Kohn. However, recent theoretical and experimental evidence indicates that electron correlation can be characterized by strong "action at a distance", especially in low-dimensional polarizable nanomaterials. Here we systematically analyze the influence of relevant properties, namely dimensionality, topology and polarizability, on the convergence and power laws governing the correlation energy. Using an accurate model system of coupled quantum harmonic oscillators we find that many-body effects can induce collective and strongly delocalized charge-fluctuation modes. These modes are ultimately responsible for a marked non-locality of the response, and an unconventional power-law decay of the dispersion interaction, which significantly deviates from the asymptotic predictions of finite-order perturbative theories. Notably, the degree of *farsightedness* of the correlation energy could possibly be tuned, opening the way to an appropriate control of the interaction in complex polarizable nanostructures.

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