Manipulating matter in dressed vacuum

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Excitons are bound pairs of excited electrons and holes and play a crucial role in many photophysics processes occurring in Nature, such as photosynthesis and light absorption in organic and inorganic semiconductor materials. On the other hand, one of the most important phenomena in Quantum Electro-Dynamics (QED) is the so-called ``Strong Coupling'' regime, which appears when the interaction between light and excitons in matter is so strong that the photon and matter components mix to create hybrid light/matter states, called polaritons. These new states have exotic properties with the potential to enrich a broad range of scientific domains spanning across Physics, Chemistry and Biology. In this talk I plan to illustrate how the merging of these two fields of research (Excitons and QED) allows managing excitons with the ambitious goal of modifying material properties, enhancing chemical reactivity and accelerating photon absorption processes in photosynthetic complexes.