Title	**Ultrafast coherent and incoherent dynamics of complex materials**
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Project description:
Scientists across several disciplines have recently become interested in the possibility that quantum-mechanical phenomena may play a role in electronic energy transfer (EET). This is a photo-physical process that happens both in natural antenna complexes in photosynthetic organisms and in synthetic light-absorbing materials (e.g. conjugated polymers) used in optoelectronic devices. In multi-chromophoric systems, emerging experimental results have clarified that the energy transfer mechanism cannot be described simply by semiclassical models that invoke incoherent 'hopping' of excited-state populations along discrete energy levels, but that electronic energy transfer involves quantum coherent pathways. This discovery opened new exciting perspectives on the possibility of controlling the efficiency and the mechanism of EET through quantum-mechanics!
In the project the attention is focused in particular on the comprehension of which factors could be responsible of that phenomenon, such as structural elements, coupling with vibrational modes or plasmonic interactions. New ultrafast spectroscopic techniques, in particular 2D electronic spectroscopy, together with more conventional time-resolved optical techniques will be employed to obtain clear experimental proofs of these effects and shed light on their origin.
The attention will be focused on artificial biomimetic multichromophoric systems, biological antenna complexes and organic/inorganic hybrid nanostructured systems including functionalized metal nanoparticles and semiconductor nanocrystals.

Publications:
[1] E.Meneghin et al., Nat. Commun. 2018, 9, 3160.
[2] M.Righetto et al., PCCP 2018, 20, 18176
[3] Collini, E. Chem. Soc. Rev. 2013, 42, 4932.
[4] Collini, E.; et al. Nature 2010, 463, 644.

Collaborations/Network:
Prof. C. Ferrante (Padova) [spectroscopy]
Dr. M. Cordaro, Dr.ssa M. Castriciano (Messina) [supramolecular chemistry, organic synthesis]
Prof. F. Remacle (Liegi); Dr.ssa B. Fresch (Padova) [theory and modeling]
Prof. F.Mancin (Padova) [materials and synthesis]

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