Title : Collective electronic fluctuations and their influence on materials properties		
First Name : EVGENY	**Name** : STEPANOV	**Laboratory** : CPHT
Email : evgeny.stepanov@polytechnique.edu		
Webpage : https://www.cpht.polytechnique.fr/		
Research Area: Condensed Matter Physics (primary field), Materials Science (secondary field).		
Methods: Quantum Monte Carlo method, Exact diagonalization technique, Path-integral formalism, Feynman diagrams, Green's functions, and related techniques		

PhD track subject: Materials with strong electronic Coulomb correlations are often characterized by various collective fluctuations, such as plasmons, phonons, excitons, Cooper pairs, and magnons, etc. (see Figure). The theoretical description of these many-body effects is challenging and requires computational efforts. The current project aims at developing and improving theoretical methods for describing such collective phenomena [1, 2]. The resulting method will provide a more accurate analysis of results of the most modern experiments, and will also be used for predicting interesting many-body effects in novel electronic materials [3-5].

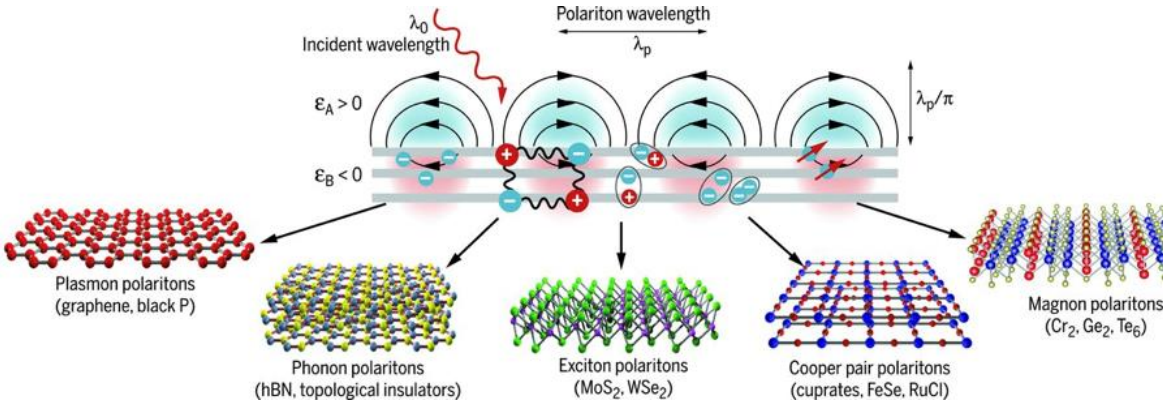

Figure: Exciting different collective fluctuations in materials by light irradiation. Figure is taken from Ref. [6].

References:

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[3] A. N. Rudenko, E. A. Stepanov, A. I. Lichtenstein, M. I. Katsnelson, *Phys. Rev. Lett.* **120**, 216401 (2018);
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