


**Internship proposal 2011-2012**

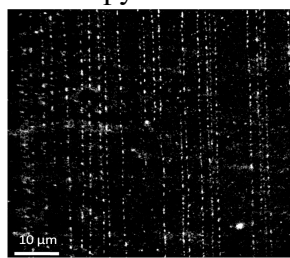
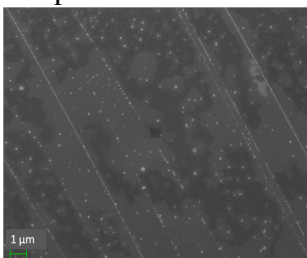
<p><b>Laboratory :</b> INSP</p> <p><b>Address :</b> Tour 22, 4<sup>ème</sup> étage, 4 place Jussieu, 75252 Paris Cédex 05</p> <p><b>Laboratory director :</b> Bernard Perrin</p>	
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**Electromagnetic coupling between gold nanoparticles and semi-conducting ones,  
an individual study**

**Scientific project :**

Future devices will be at least partly composed of nanoparticles due to their unique optical properties associated with their small size : plasmonic absorption for metallic nanoparticles and highly intense fluorescence for semi-conducting nanoparticles. A large number of experimental works has been devoted to individual nanoparticles, but one main interest lies in the strong coupling, which has been predicted between neighboring nanoparticles, due to the field exaltation in the proximity of gold nanoparticles. We expect a huge energy transfer between gold nanoparticles and fluorescent ones, which may deeply modify the fluorescence properties.

The phenomenon is still not well understood because well-defined hybrid systems are still scarce. In this work, we propose to study the coupling phenomenon within lines of nanoparticles in which we control the distance between nanoparticles by 4 orders of magnitude down to 1.5nm. The distance between lines being of the order of one  $\mu\text{m}$ , individual lines can be studied. The student will thus prepare the hybrid lines and will study the coupling phenomenon by absorption spectroscopy and one or two photons fluorescence spectroscopy and microscopy.



Left, image SEM image of controlled alignments of gold nanoparticles d'or of diameter 5 nm.  
Right, fluorescence microscopy image of CdSe-ZnS nano-crystals of diameter 5 nm.

[1] Book : “Metal enhanced fluorescence”, ed. Chris D. Edge, Wiley, 2010.

**Techniques in use :**

AFM, spectrophotometry, fluorescence microscopy and spectroscopy with one or two photons

**Applicant skills :**

**Granted internship :** yes ( 400€/month)

**C'nano IdF laboratory (France only) :** yes

**Possibility for a thesis :** yes (type of grant : MRT)