



### Internship proposal 2009-2010

<p><b>Laboratory: Photonique Quantique et Moléculaire (LPQM)</b> CNRS - ENS Cachan - Ecole Centrale Paris <b>Address:</b> ENS Cachan, 61 av. du Président Wilson 94235 Cachan cedex <i>The internship will take place in Boucicaut campus</i> <b>Laboratory director:</b> Isabelle Ledoux-Rak</p>	
<p><b>Internship supervisor:</b> Bruno Palpant, prof. Ecole Centrale Paris <b>Phone:</b> 01 44 27 39 85 <b>e-mail:</b> bruno.palpant@ecp.fr</p>	

### *Light-heat nano-converters and photonic applications*

#### **Scientific project:**

Metal nanoparticles under visible electromagnetic radiation are able to act as heat nanoscale sources due to a series of internal energy exchanges. This converting process can be employed in various fields, particularly for realizing optical, chemical or biological functions. One can then envisage materials or devices whose functionality is only activated and controlled by light.

The internship will be devoted to the investigation of a photonic device (like a 1D nanocomposite photonic crystal or an anisotropic film of gold nanorods). The goal is to measure by both conventional optical techniques and ultrafast laser spectroscopy the characteristics of the energy conversion and its consequences on the optical response, and then to analyze the results in order to optimize the material. The internship could be followed by a doctorate thesis dedicated to the developments of this initial study.

The team will consist of a permanent researcher, a temporary researcher and a PhD student.  
The internship will take place in the *Institut des Nano-Sciences de Paris* (Paris 15<sup>e</sup>).

#### **Techniques in use:**

Our team has developed an original experimental setup allowing the measurement of the ultrafast optical response dynamics of materials. This uses femtosecond laser pulses in a pump-probe scheme: a high energy pulse (pump) modifies the medium properties; then a second pulse having weak energy probes this perturbation. By measuring the probe beam intensity and by varying the delay between the two pulses, the relaxation dynamics of the medium nonlinear optical response is retrieved. The probe beam is a white light continuum generated in a sapphire plate, which enables the measurement in a wide spectral range.

#### **Applicant skills:**

The applicant has a good knowledge in condensed matter physics, in nanosciences and if possible in optics. Beyond, autonomy, sociability and sense of initiative will be qualities required.

**Granted internship:** not yet decided by the lab

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

**Possibility for a thesis:** yes (type of grant : French Ministry of Research fellowship)