



Nanosystem engineering and biophotonics

*Co-organised by Joseph Zyss and Malcolm Buckle,
Institut d'Alembert, Ecole Normale Supérieure de Cachan
March 30th to April 1st 2009*

Themes and objectives:

As exemplified by the title of meeting, the selected theme, *Nanosystem engineering and biophotonics*, encompasses a large emerging discipline at the crossroads of nanotechnologies and life sciences engendered by a convergence of interest and competence between two communities, that of physics and chemistry on the one hand and life sciences on the other. Tools and methodologies that have revolutionised common laboratory procedures and have enormously impacted on the perspectives of life sciences are rapidly evolving as a result of continuous new developments in nanosciences and nanotechnologies with a notably important contribution from photonics and advances in bio-imagery and nano-photonics.

A major aim of this meeting is to present a critical overview of the confrontation between what is being offered globally by physical sciences and what is required by life sciences illustrated by important advances in disciplines ranging from nano biochemistry through novel high resolution cellular imagery methods to nanophotonics and new generations of bio components integrating optoelectronics and microfluidics.

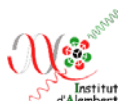
A major driving force for these disciplines arises from ongoing deeply seated problems currently encountered in cellular biology and fundamental pharmacology, disciplines which clearly fuel new research fields whilst equally instigating high quality fundamental basic research.

The proposed high level international and multidisciplinary scientific meeting will address the cutting edge of research at the interface of nanoscience, nanotechnology, photonics and life sciences. The meeting aims at focusing the scientific community and at establishing dialogues between the following different disciplines involved at both fundamental and applied levels: physics, chemistry, biochemistry, materials science, component technology and biotechnologies; the development of novel investigative approaches and implementation on a nanoscale being a common shared element amongst most of these axes.



Other disciplines concerned by the proposed meeting include teachers involved in establishing pluridisciplinary courses; students, industrial researchers, decision makers at different levels in administration and industry and even interested members of the general public. Consequently, the meeting has several goals with respect to the scientific community:

1. To review at an international level the state of the art of research progress in this huge emerging field of nanobiosciences as defined above, and to address as large an audience as possible of principal actors and decision makers.
2. To draw attention to the level of scientific and technological advancement at the Institut d'Alembert in the context of the new state of the art dedicated building on the Ecole Normale Supérieure de Cachan campus, to promote its role as a major player in nanosciences at an international level and to emphasize the role of different partners at a local, national, European and international level.
3. To ascertain the range and pertinence of the various themes and research strategies within an extremely competitive environment by means of a series of comparisons at different levels (regional, national, European and international) of results from major institutes. Emphasis will be placed on a number of privileged partners: regional networks in Paris region such as C'Nano, PRES UniverSud, RTRA Triangle de la Physique, European networks of major institutes and laboratories in photonics and biophotonics, principal international collaborations such as the Phoremest and NanoMatch European networks, The CNRS-Weizmann Institute Associated European Laboratory in NanoBioSciences, MIT (USA), Georgia Tech (USA), principal Canadian laboratories and major research institutions in Europe and Asia.
4. By using specific sessions organised around the speaker and tutorial presentations in a way reminiscent of that used in the Gordon conferences, provide an equilibrated yet complete overview of the activities and different objectives of nanobiosciences and nanobiotechnologies to cover three aspects:
 - a. Research and the conditions required to maintain the highest possible level of competitiveness in the field across several themes.
 - b. Teaching and the pedagogical problems associated with the necessity of providing pluridisciplinary training inherent to the theme, (in this respect we will rely on the knowledge gained from several years experience of the Erasmus Mundus "Monabiphot" masters school at the ENS Cachan).
 - c. Industrial aspects illustrated by specific cases of fruitful industrial-research partnerships that will form part of a special session.



Date: Monday 30 March, Tuesday 31 March and Wednesday 1st April 2009 (3 days)

N° of participants: ~120 to 150

Presentations: 12 invited lectures, other speakers will be selected from contributed submissions. Poster sessions will be organized

Location: Amphitheatre Marie Curie (and hall Villon for posters and meals) at the ENS Cachan. Some special sessions will be organised in the amphitheatre of the ALEMBERT Institute.

Scientific themes:

The 4 principal axes of the meeting are:

- *Micro- and nano-systems*
- *Nanochemistry*
- *Life sciences*
- *Physics and nanophotonics*

These 4 main axes will be distributed across several sessions (with ~2 sessions per half day over 6 half days).

The main themes therefore will be:

- Single molecule studies and single object (e.g. cell) optical imaging
- Cellular imaging: two photon and SHG microscopy, FCS, AFM, Mass Spec imaging, THz, others
- Engineering of functional photoactive nano-assemblies
- Ultrafast spectroscopy studies of nanosystems
- Label-free micro-arrays
- Plasmon based imaging
- Cellular nanostructures (DNA topology, chromatin organization, cytoskeleton)
- Hybrid Nano-bio-systems
- New generations of Biosensors and biochips (DNA, proteins, cells) for diagnosis, screening and target recognition. Highly parallel and high throughput systems
- Optical Tweezers.
- Microfluidics
- Convergence between communication and biosensing systems.
- Theory and modelling for experimentalists in nanobioscience and nanobiophotonics

Furthermore two special sessions will be organised on the following subjects:

- Industrial synergies in nanobiosciences
- Pluridisciplinary aspects in training towards nanobiosciences.

