Summer School in NCSR "Demokritos"
22 – 26 June 2009, Athens, Greece
"Methods in Micro – Nano Technology and Nanobiotechnology"

Organizer :
National Center for Scientific Research "Demokritos"
in collaboration with the
Foundation of Biomedical Research of the Academy of Athens
and invited experts from other Nano2Life partners

Information: www.imel.demokritos.gr

Target

- Modern Research takes advantage of Micro and Nanotechnology developments.
- Merging areas of research (Nanobiotechnology) demand interdisciplinary skills.
- Necessary for researchers from Life Sciences, Chemistry and Engineering to acquire skills in Micro and Nanotechnologies, nanomedicine.

Establish common language between the various disciplines- promote interdisciplinary research

The summer school offers: classroom and laboratory experience on:
micro and nano-technology processes / materials / applications
Targeted in: Nanobiotechnology, Nanomedicine

Who should attend

Group leaders involved in molecular biology or biotechnology
Post Doctoral Fellows, Graduate students with
Life Science / Science / Engineering background, medical doctors
All those who wish to apply micro-technology in their research

Maximum number of registrants persons: 15

Fees: 1000 Euro
(includes handouts, coffee-breaks, lunches, school dinner, excursion, NO accommodation)

Deadline: May 25th 2009

Syllabus

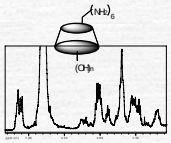
Section 1: Principles of biochemistry, cell biology, physics and microelectronics.
1.1: Cell biology principles
1.2: Structure of biological macromolecules
1.3: Microelectronic Materials and Device Technology
1.4: Introduction to nanobiotechnology / Sensors for nanobiotechnology
Unit 2.1: Micro and Nano-fabrication science and technology
2.1.1 and 2.1.2: Patterning technologies
2.1.3: Patterning of biomolecules and other biological substances
2.1.4: Molecular bioelectronics
Laboratory 2.1.1: Fabrication of microfluidic devices on plastic substrates by +2.1.2 soft lithography and deep polymer plasma etching

PMMA Capillaries

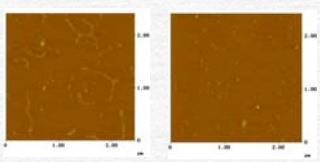
Laboratory 2.1.3: SPM Techniques for molecular devices

Unit 2.2: Nanomaterials for bio-applications, Characterization, Imaging
2.2.1: Drug Delivery and Targeting Systems - Focus on Liposomes
2.2.2: Drug Delivery and Targeting Systems – Focus on cyclodextrin delivery, studied by NMR and XRD)
2.2.3: Magnetic nanoparticles for bioapplications
2.2.4: Imaging with Scanning Probes (AFM, STM, SNOM)

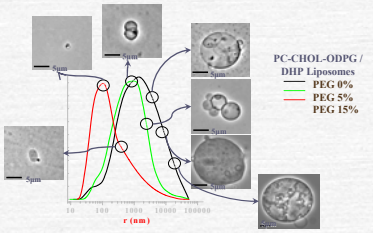
Laboratory 2.2.1: Liposomes: preparation and characterisation by dynamic light scattering and ζ-potential



Laboratory 2.2.2: Drug inclusion in cyclodextrins: monitoring in situ by NMR spectroscopy X-ray diffraction characterisation of drug inclusion and 3-D visualisation



Atomic Force Microscopy
Formation of DNA nanoparticles
of ~40 nm diameter

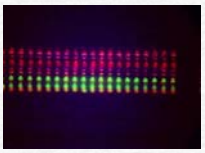


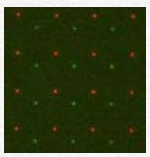
Liposome-liposome interactions: Correlation of Optical Microscopy and Dynamic Light Scattering results

Unit 2.3: Molecular and Cellular biology and Applications
2.3.1: Gel-based protein analysis methods
2.3.2: Non-gel based protein analysis methods
2.3.3: Binding Assays and Immunosensors
2.3.4: DNA and Protein arrays: fabrication, detection and applications

Laboratory 2.3.1: Protein separation by two-dimensional electrophoresis
Laboratory 2.3.2: Mass spectrometry
Laboratory 2.3.3: Fabrication of protein microarrays using nanoplotter
Laboratory 2.3.4: Fabrication of protein microarrays using lithography
Laboratory 2.3.5: Fluorescence detection of protein arrays
Laboratory 2.3.6: Bioinformatics basic theory & laboratory
Laboratory 2.3.7: Structural Bioinformatics: Molecular Simulations and Visualization
Laboratory 2.3.8: State of the art fluoresence imaging & confocal microscopy of biological samples

Twelve rows of different protein spots fabricated in 12 succesive lithographic steps





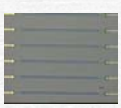
Fluorescence picture of the rabbit γ-globulins and biotinylated-BSA spot arrays after a 2 h immunoreaction with a mixture of AF 546 labeled streptavidin (red spots) and AF 488 labeled anti-rabbit IgG antibody (green spots). The spot size is approximately 4 μm.

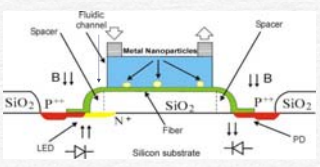
Section 3: Towards Integrated Nanobiotechnology systems

3.1: Principles of Integrated Biosensing Devices

Laboratory 3.1: Operation of a lab-on-a-chip optical device using model assays and real time measurements

Monolithic silicon optocouplers





Laboratory 3.2: Demonstration of a capillary fluoroimmunosensor