N2L Summer School in NCSR "Demokritos"
Athens, June 30 - July 10, 2008
"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: 20

Fees: N2L members:1000 Euro
Others: 1400 Euro
(includes handouts, coffee-breaks, lunches, school dinner, two excursions, NO accommodation)

To encourage Greek participation Demokritos will grant partial scholarships to selected Greek participants upon request on the application form .

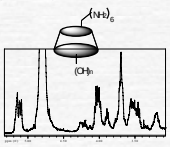
Deadlines: N2L May 7th - Others May 14th

Syllabus

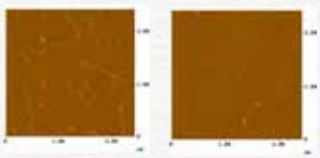
Section 1: Principles of biochemistry, cell biology, physics and microelectronics.
1.1: Cell biology principles
1.2: Structure of biological macromolecules
1.3: Microelectronic Materials and Device Technology
1.4: Introduction to nanobiotechnology
Unit 2.1: Micro and Nano-fabrication science and technology
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 soft lithography
Laboratory 2.1.2: Fabrication of plastic microfluidic devices by Lithography and deep polymer plasma etching techniques

PMMA Capillaries

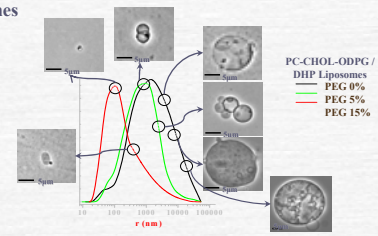
Laboratory 2.1.3: Electrical characterization of tunnelling devices based on organic molecules or biomolecules
Unit 2.2: Nanomaterials for bio-applications, Characterization, Imaging
2.2.1: Targeting RNA with small molecules: a Pharmaceutical Industry Study
2.2.2 and 2.2.3: Drug Delivery and Targeting Systems - Focus on Liposomes
2.2.4: Bioengineered nanomaterials
2.2.5: Magnetic nanoparticles for bioapplications
2.2.6: Biomimetic Materials Synthesis, Principles and Applications
2.2.7: Imaging with Scanning Probes (AFM, STM, SNOM)
2.2.8: Fluoresence imaging and 3D image visualization using confocal microscopy
Laboratory 2.2.1: Drug inclusion in cyclodextrins: monitoring in situ by NMR spectroscopy X-ray diffraction characterisation of drug inclusion and 3-D visualisation



Laboratory 2.2.2: Liposomes: preparation and characterisation by dynamic light scattering and ζ-potential
Laboratory 2.2.3: Video enhanced optical microscopy and Atomic Force Microscopy of Liposomes



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

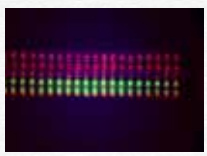


Liposome-liposome interactions: Correlation of Optical Microscopy and Dynamic Light Scattering results

Laboratory 2.2.4: State of the art confocal microscopy of biological samples
Laboratory 2.2.5: Magnetic nanomaterials for bioapplications
Laboratory 2.2.6: Determining Magnetic Anisotropy at the Nanoscale

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
2.3.5: Metabolomics in the Post-Genomic Era
2.3.6: Introduction into Bioinformatics
2.3.7: Applied Bioinformatics in BioNanoTechnology

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



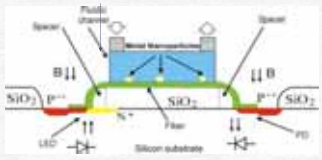
Twelve rows of different protein spots fabricated in 12 succesive lithographic steps

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.

Laboratory 2.3.6: Bioinformatics laboratory

Section 3: Towards Integrated Nanobiotechnology systems
3.1: Principles of Integrated Biosensing Devices
3.2: Lab on chip devices: Principles, applications, opportunities
3.3: Acoustic wave sensors: from device fabrication to biological applications
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