

## Nanosensing: Materials, Devices, and Systems III (PT404)

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*Keynote Presentation:* **Angela M. Belcher**, Materials Science and Engineering, and Biological Engineering, MIT (tentative)

This conference will consider existing and new sensing methods as well as recent advances in new nano-materials and devices. Its objective is to bring together experimentalists, theorists, computational specialists, and development engineers to provide an interdisciplinary forum to discuss physical understanding and state-of-the-art of active and passive electronic and optoelectronic nano-materials and devices for sensing applications. Areas of research that are particularly active include the growth, fabrication, and characterization of nano-structures such as nanowires, nano-bridges, nanotubes, quantum dots, quantum wires, and bio materials for sensing applications.

Well-controlled nanostructures for sensor applications can be synthesized and manipulated by lasers (e.g., pulsed laser ablation) to possess novel functional properties by impurity doping and surface modification. Such modifications have the potential of detecting selectively special bio-molecules by photoluminescence, surface-enhanced-resonant-Raman-scattering, etc. For efficient nano-sensors, physical and chemical properties of nanostructures are required to be controlled through changing states of functional impurities and surfaces by laser light without heating. This is how laser-material interactions have contributed to the development of areas of nanotechnology and nano-science. Different other methods of growing and synthesizing nano-structures have attracted the attention of the research community.

Application of nanostructured materials for biological applications, biologically assisted nanofabrication, and the development of next-generation of biosensors and biomedical instrumentation for improved sensing applications are attracting increasing interest in the scientific community.

This special meeting will be of interest to researchers in nano-science and technology. We hope to bring together researchers from the wide fields of materials science, optics, physics, chemistry, biology, electrical engineering, etc.

### Nanowires, Nanodots, and Nanotubes for Sensing

- novel nanowire, nanodots and nanotube growth and synthesis techniques
- integration with conventional devices and circuits
- novel 3D confined structures nanowire and nanotube-based sensing devices and systems for mechanical, chemical, biological, and medical applications
- interactions between photons and nanowires, nanotubes, and nanodots
- functionalization of nanostructures for sensing.

### Advanced Topics in Sensing Materials and Devices

- advanced patterning: nano-imprinting e-beam lithography, deep-UV, etc. for nano-sensor fabrications
- new materials: semiconductors, dielectrics, polymers, superconductors, organics, magnetics, pyroelectrics, hybrid composites, nano-particles and nanocomposites
- Techniques for improvement of the sensing properties, surface treatment and surface functionalization

- characterization techniques: optical, electrical, structural, ionic transport
- MEMS, MOEMS, NEMS and NOEMS devices for sensing
- nano-imaging for medical application, astrophysics, etc.
- nano-photonics for detection and sensing applications
- surface-enhanced-(resonant)-Raman-scattering (SERS) and applications in single molecular sensing
- theoretical investigation of the phenomena for understanding the sensing mechanism.

### Nano-Bio-Structures

- application of nanostructure materials for biological sensing applications.
- biologically assisted nanofabrication of sensors
- photonic studies of nanoscale interactions in bio-structures
- application of biological materials for the development of nanophotonic and electronic devices
- next-generation of biosensors for improved sensing
- development of new photonic devices and systems that are hybrids of traditional polymeric and semiconductor materials with biological materials
- multifunctional nanoparticles
- device design and processing of nanophotonics for biological applications
- modeling and simulations of bio-nanophotonics
- genomics and proteomics, and nano-scaffold for bio-applications.

### Biomimetics and Hybrid Systems

- biologically modified nanocrystals, nanotubes, and nanorods and their sensing applications
- interfaces of biomolecules with semiconductor devices and structures
- bio-electronic interfaces and bio-sensing
- electrical characterization of hybrid bio-inorganic devices and structures
- interactions of proteins and other biomolecules with inorganic surfaces
- synthesis and characterization of bio-inorganic hybrid molecules and nanostructures
- bio-inorganic hybrid materials for medical applications
- template synthesis, crystal growth, and self assembly of bio-inorganic systems
- guest-host interactions between various molecules
- functionalization and patterning of inorganic surfaces with biomolecules and bio-organisms.

### Nanosensing systems

- circuit interfaces of sensors
- sensitivity, selectivity, resolution
- CMOS inferable process
- data accusation and interpretation
- functionalization for multi-purpose sensing
- nanosensing systems.

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