

# BioChip Physics

## Scalability and Fundamental Detection Limits

Division of Biological Physics  
APS March Meeting Special Focus Session  
March 10-14, 2008 New Orleans

Biochips are the next generation in the evolution of technological miniaturization. They are embarked on their own new form of Moore's Law, with many challenges concerning the scalability of biological detection based on the physics of fundamental detection limits.

### Topics:

- Laser ring cavity biosensor physics
- Waveguide biosensors
- Nano-porous Sensors
- ARROW (anti-resonant reflecting optical waveguide)
- Resonant mirror sensors
- Surface plasmon resonance; plasmonic materials for sensors (including surface-enhanced Raman)
- Nanoscale biosensing based on cantilevers and microresonators
- BioCD biosensors
- Colorimetric diffraction sensors
- Bio-layer interferometric approaches
- Membrane-based biosensors (potentiometric or optical)
- MOSFET-charge-based biosensor physics
- SQUID-based biosensor physics
- Detection constraints: Nonspecific Adsorption
- Micro-channel fabrication: Rapid Prototyping, creating functionalized surfaces
- Nanometer scaling limits
- Quantum detection limits

Research in biochips and biosensors has expanded rapidly in recent years, drawing scientists from often orthogonal fields and backgrounds. This Focus Session provides an important mechanism to help establish a common ground among these researchers, focusing on detection physics and fundamental limits.

The spectrum of physics upon which biochip technology is based is perhaps even broader than the physics of the semiconductor chip. While detection encompasses optical, magnetic, electronic, mechanical and plasmonic physics—the capture of biological markers encompasses micro- and nano-flow physics, nanomechanics, physical chemistry, and thermodynamics, among others.

### Invited Speakers:

**Max Sonnleitner** (CTO Bioident Inc.)  
*“Direct-Print Organic Photonics for  
Biodetection Chips”*

**Amanda Haes** (University of Iowa)  
*“Nanoscale Building Blocks for  
Biosensor Development”*

**George Hong** (Millipore Corporation)  
*“Rapid detection of microorganisms -  
State of art and future challenges”*

### Session Organizers:

**David Nolte** (Purdue University)  
nolte@physics.purdue.edu

**Peter Kiesel** (PARC)  
peter.kiesel@parc.com

..... Abstract Deadline: Nov. 27, 2007 .....