Sunday Afternoon, November 3, 2002

Biomaterials Plenary Session
Room: C-201 - Session BP-SuA

Biomaterials Plenary Session
Moderator: K. Healy, University of California, Berkeley

3:00pm **BP-SuA1 Visions of Science at BESSY SASE FEL in Berlin** **Aldershof**, ***W. Eberhardt***, BESSY GmbH, Germany **INVITED**

BESSY is planning to build a SASE FEL facility covering the photon energy range from 20 eV to 1 keV at the site next to the existing BESSY II storage ring. This new facility will offer laser like photon beams with fully coherent, high power (mJ) pulses of ≤20 fs duration, enabling a whole set of novel experiments dedicated to understand dynamical processes in matter or for the investigations of very dilute systems. This SASE FEL covers the traditional BESSY II photon energy range, which is especially suited for electronic structure investigations of atoms, molecules, clusters, and solids. With the anticipated temporal resolution of ≤20 fs charge transfer processes and time resolved 'femtochemistry' studies as well as magnetization dynamics in magnetic materials establish some of the major areas of scientific interest in this new facility. Furthermore in microscopy on soft-matter and biological samples it is possible to acquire an image using a single laser pulse. Thus stroboscopic time resolved images of dynamical processes in living cells become possible. In general, the science planned at this facility is complementary to the science envisioned for the planned TESLA X-FEL facility at DESY and Linac Coherent Light Source (LCLS) at Stanford. Following the presentation of the parameters and the layout of the proposed facility, the Scientific Case will be presented as it was developed by the prospective user community in the course of several scientific workshops and in discussions.

3:40pm **BP-SuA3 Large Scale Integration of Microfluidic Devices, and Applications to Biology**, ***S. Quake***, Caltech **INVITED**

4:20pm **BP-SuA5 Biochips Designs, Challenges, and Bioanalytical Applications**, ***L.J. Kricka***, University of Pennsylvania Medical Center **INVITED**

Biochips, in all of their guises are the most active area of research and development in the analytical sciences. These micro-miniature devices are produced using techniques originally developed in the microelectronics and in the printing industry. Although some microchip devices have been commercialized (e.g., capillary electrophoresis chips), many challenges and issues remain for the routine implementation of these micro-analytical devices. These include surface chemistry effects in the sub-microliter confines of a microchip chamber, the interface between the <1 cm2 microchip and the human operator, utilization of plastics for construction, and the development of low cost, mass production methods. Biochips design has usually been empirical, but new micro-fluidics modeling software offers a route to rational design of at least the fluidic components of biochips. The current scope of applications for biochips include protein and nucleic acid analysis, genetic tests, cell selection, immunoassay, and various molecular separation techniques. A goal in biochip research is integration of all steps in an analytical process on a single chip - the so-called "lab-on-a-chip", and there are a range of biochips that combine several sequential steps of an overall analytical procedure on a single disposable biochip device. The benefit of this approach is faster and simpler analysis. Further miniaturization of the biochip will lead to the nanochip, i.e., a device with dimensions less than 100 nanometers. Nanotechnology is at an early stage, but already significant progress has been achieved in directions that may lead to useful analytical devices (e.g., carbon nanotubes). The control of atomic and molecular composition of surfaces in a nanochip device may provide unexpected improvements in analytical performance over conventional devices in which surface composition is imperfectly controlled, and much remains to be done in this active and speculative area of research.

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