Sunday Afternoon, October 27, 2013

Biomembranes and Emerging Tools in Bioscience
Plenary Session
Room: 201 B - Session BP+AS-SuA

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Plenary Session
Moderator: P. Kingshott, Swinburne University of Technology

3:00pm **BP+AS-SuA1 A "GoogleMAP"-type Molecular View of Microbes and Biofilms - From Culture to People**, ***P.C. Dorrestein***, University of California San Diego **INVITED**

The world is covered in one large biofilm. The molecules the microbes produce affect all areas of biology-from crop growth to the balance of health and disease in humans. In this presentation we highlight the spatial analysis of molecules and mapping of structural space through molecular networking using a variety of mass spectrometry and informatics methodologies. We will show its applicability to understanding the molecular nature of interacting microbes grown in Petri-dishes all the way to interacting microbes on people. In effect we are beginning to lay the foundation to create a "GoogleMAP" for our molecular understanding of microbes.

4:20pm **BP+AS-SuA5 Tools for Organisation of Proteins on the Nanometer Scale**, ***G.J. Leggett***, University of Sheffield, UK **INVITED**

The organisation of proteins on biologically relevant length-scales – tens of nm – remains challenging. Protein molecules present substantial problems because of their tendency to become rapidly and irreversibly adsorbed onto many surfaces, and their propensity for post-adsorption conformational change. On nanometre length-scales, where characterisation of structures remains difficult, any problems associated with non-specific adsorption, or with ineffectual control over protein binding and orientation, are exacerbated. Our goal has been to integrate top-down and bottom up fabrication methods to yield robust, repeatable routes to the fabrication of protein nanostructures. We have developed a suite of photochemical routes to molecular nanopatterning. Near-field techniques may be used for the fabrication of arbitrary patterns in regions tens of micrometres in size, and interferometric methods yield periodic structures over square cm areas in fast, simple, cost-effective processes. Oligo(ethylene glycol)-derivatised nitrophenyl protecting groups have proved to be highly effective at eliminating non-specific adsorption, and may be readily deprotected to yield amine groups that can be coupled to biotin or nitrilotriacetic acid for site-specific immobilisation of proteins. UV photodegradation may be accomplished in a variety of ways – by direct degradation of oligoethylene glycol functional groups to yield reactive aldehyde functional groups in a single step; by unzipping of methacrylate brushes; by dehalogenation of initiators for atom-transfer radical polymerisation; and by localised photcatalytic lithography to yield 50 – 70 nm protein structures that may be readily imaged by confocal microscopy. Finally, simple photochemical methods also provide routes to the fabrication of polymeric and metallic nanostructures (for plasmonic readout) for use in fundamental studies of membrane protein organisation and function.

5:00pm **BP+AS-SuA7 Surface-Specific Sum-Frequency Vibrational Spectroscopy**, ***Y.R. Shen***, University of California, Berkeley **INVITED**

Infrared-visible sum-frequency generation has become a most powerful and versatile spectroscopic tool for surface and interface studies in recent years. It is based on the simple idea that surface and bulk of a material generally have different symmetries. The technique has many advantages over other probes: it is highly surface-specific, has high spatial, temporal and spectral resolution, is capable of remote sensing and probing surfaces in hostile environment, and most importantly, can be applied to any interfaces assessable by light. Consequently, it has opened many new opportunities for investigation of surface and interface properties and processes in various disciplines.

In this talk, we shall give a brief review on the recent development of sum-frequency vibrational spectroscopy. We shall describe how the technique can be used to probe surface and interface structures of neat materials from their surface vibrational spectra. Water interfaces will be presented as examples. Future prospects will be discussed.

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