Faculty of Engineering
Distinguished Lecture Series

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Biomimetic Materials Controlling Cellular Activity

Professor Alan Rowan

Director of Australian Institute for Bioengineering and Nanotechnology (AIBN)
The University of Queensland

Date : 8 November 2019
Time : 2:00 pm - 3:30 pm
Venue : SHB 801, 8/F, Ho Sin Hang Engineering Building, CUHK

Abstract:

Fibrous networks of biopolymers are found in both the intracellular and extracellular matrix (ECM). From the microscopic scale of a single cell to the macroscopic scale of fibrous tissues, biopolymers with different stiffness control cellular processes such as cell differentiation, proliferation and communication. Recently, a large number of hydrogels has been developed to create an artificial ECM for biomedical applications. However, the mechanical environment inside and outside the cell is not determined by a single component. Multiple biopolymers with different structural and mechanical properties which physically interact with each other, make the mechanical environment of a cell *in vivo* much more complicated than the environment of a cell in a single-component artificial matrix.

The mechanics of natural biopolymer gels are very different from most synthetic hydrogels because they show strain stiffening behaviour. Reconstituted networks of cytoskeletal polymers such as intermediate filaments or extracellular biopolymers such as collagen show a large increase in stiffness upon an applied stress. The stiffening response prevents these networks from breaking under external stresses and also enables communication between cells growing in these materials. Recently a new biomimetic polymer hydrogel was developed with unique cytomimetic properties, based upon oligo (ethylene glycol) grafted polyisocyanopeptides. These extremely stiff helical polymers form gels of materials properties almost identical to those of intermediate filaments and ECM. The unique ability of these materials and their application in cell growth and drug therapeutics revealed the importance of polymer stiffness and material non-linear mechanics. How to control the nonlinear mechanical properties and how the stiffening response is affected by the composite nature of natural biopolymer networks will be presented

Biography:

Professor Alan Rowan, is currently an ARC Laureate fellow, Chair of the Scientific Advisory Board for the ARC Centre of Excellence in Convergent Bio-Nano Science and Technology, and board member of: The UQ Confucius Institute; The Dow Centre for Sustainability; and of UQ Senior Management group. As the Director of AIBN, Prof. Rowan oversees a team of 500 researchers and professional staff. In recognition of his translational effort Prof. Alan Rowan was nominated in 2013 as one of the Netherlands Science Entrepreneurs of the year. In the last three years he has been granted five patents and have five pending in the area of nanomedicine. Prof. Alan Rowan has also been involved in the start up of four companies: Encapson, Noviotech, NovioSense and Secmatix.

Registration : www.erg.cuhk.edu.hk/erg/Events

All are welcome