Speaker: Dr Wing Ying Chow (Department of Physics, University of Warwick).
Title: Biological structures in the extracellular context
Date: 3rd May 13.00 - 14.00 (Week 31).
Room: Lecture theatre PLT.

Abstract

The cell is often seen as the fundamental biological unit for life on Earth. However, in multicellular organisms, including humans, interactions between cells are necessary to enable life as we experience it. One key aspect of these interactions is the extracellular matrix (ECM). The ECM is made by cells but can change cell behaviour; it withstands external force but also transduces them to the cells; it undergoes structural changes as a result of the physiological and pathological states of the organism.

The complexity of the ECM matches the complexity of cells. The ECM is a 3D structure consisting of a range of biomolecules. All the types of molecules that can be found inside cells can also be found outside the cell, in the ECM; this includes proteins, sugars, lipids, nucleic acids, and many other small biomolecules, though usually at different proportions and often at different sizes. Previously, the ECM was simply seen as a physical scaffold, not as biologically interesting as the cell itself. In recent years, it became indefensible to study any kind of biological phenomenon or medical condition without considering the role played by the extracellular aspect.

Many tools exist for interrogating the composition and structures found in the ECM that underlie its biomechanical and biological signalling functions. However, for determining atomic structures on intact ECM, especially in the form of tissues (e.g. bone, cartilage), the tools are far more limited. Frequently, the tools used require knowing in advance what we are looking for and breaking down the ECM before investigating it. Solid-state NMR (ssNMR) can allow a less biased characterization of the structures present within a more native-like ECM at the atomic level, thus providing insight that cannot be obtained through other techniques. The development of approaches that integrate ssNMR insight with other techniques, especially to gain insight into certain human diseases, will be illustrated through previous work in bone and cartilage.