Meeting report: International Conference on the Mechanics of Biomaterials and Tissues

The 4th International Conference on the Mechanics of Biomaterials and Tissues was held at the Waikoloa Beach Resort, Hawaii from 11th – 15th December 2011 and chaired by Prof. Markus Buehler from MIT. This biennial meeting was attended by over 200 delegates from many institutions with diverse areas of expertise, making it an excellent forum for presenting work related to the mechanics of biological materials.

With 14 keynote talks and over 100 oral presentations as well as 130 poster presentations, the ICMOBT covered a diverse selection of topics, ranging from the mechanics of hard and soft tissues to biomimetic and bioinspired materials. The meeting began with a keynote address from Prof. Peter Fratzl, from Max Planck Institute of Colloids and Interfaces, entitled "Multiple scale interfaces and mechanical adaptation of biological material". This fascinating talk addressed the important role the hierarchical organisation of biological matrices plays in determining the mechanical properties of a variety of tissues. The "Soft Tissues" sessions were also of particular interest, and included presentations on the mechanical properties of a variety of soft tissue components. Highlights included a presentation by Prof. Anthony Weiss, in which he described how tropoelastin can be used to generate functional elastic scaffolds that promote cell attachment, spreading and proliferation. Dr Rene Svensson spoke about the failure properties of collagen fibrils and highlighted the importance of cross-links in the fibril mechanical response. Other presentations in this session covered a wide variety of topics, including the effect of diabetes-related glycation on the properties of the Achilles tendon, the distinct visco-elastic response of tendons with different functions, regulation of articular cartilage tensile properties by IGF-1 and TGF-β1 during in vitro growth and the effect of smoking of the structure and function of skin.

Another theme covered during the meeting was the effect of matrix mechanics and cell matrix interactions on cell properties. Prof. Huajian Gao from Brown University gave a keynote talk entitled "Probing mechanical properties of cell-material interactions" in which he explored how cells sense the mechanical properties of their matrix and how they actively control adhesion via cytoskeletal contractile machinery. Another keynote on this topic, entitled "Mechanopathology of human diseases – why mechanics matter" was presented by Prof Chwee Lim from the National University of Singapore. Prof Lin explained how the mechanical properties of cells are altered with disease, and how these alterations may be used as biomarkers for early diagnosis. Other presentations followed this theme, with several talks on the effects of matrix stiffness and stress relaxation on cell phenotype and stem cell differentiation.

The ICMOBT was a very useful and interesting meeting to attend, particularly as delegates were from backgrounds including materials, engineering, cell biology and chemistry. This resulted in interesting discussions as topics were addressed from a number of different perspectives, which highlighted how a multi-disciplinary approach can be used with great effect in order to understand the structure function relationships in biological materials. The 5th ICMOBT will be held in December 2013, venue TBA, and I would urge any matrix biologists with an interest in tissue mechanics to attend!