



## Topical Research Meeting on Physics in Food Manufacturing

### (P10) Towards realistic tribological models: experimental structural studies of confined lubricating surfaces

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Understanding the forces acting on macromolecular structures at surfaces is vital to a number of different branches of science and engineering. A variety of experimental techniques have been developed to study these forces directly, including the pioneering work using surface force apparatus and AFM. However, recently we have made a number of innovations in the field of direct surface confinement [1-3].

In this novel approach we have developed a unique surface force type apparatus that allows direct measurements of the structure of surface adsorbed layers under a confining pressure using neutron reflection. We have shown that inflation of the membrane against a solid surface provides close and even contact between the interfaces over a large surface area. This device has been used to study the structure and the mechanical properties of a number of polymer systems under direct confinement as well developing this technique towards the broader soft matter community, looking in particular at biorelevant cartilage systems and understanding the lubricating mechanism of saliva.

This technique could offer a step-change in understanding of the tribological-structural relationship at surfaces, with the potential impact on the food and manufacturing industry explored fully.

- [1] W.M. de Vos, L.L.E. Mears, R.M. Richardson, T. Cosgrove, R. Barker & S.W. Prescott, *Macromolecules*, 46(3), 1027-1034 (2013).
- [2] S.B. Abbott, W.M. de Vos, L.L.E. Mears, R. Barker, R.M. Richardson, S.W. Prescott, *Macromolecules*, 47(10), 3263-3273 (2014).
- [3] S.B. Abbott, W.M. de Vos, L.L.E. Mears, B. Cattoz, M.W.A. Skoda, R. Barker, R.M. Richardson, S.W. Prescott, *Macromolecules*, 48(7), 2224-2234 (2015).