

# Nanoscale Organisation and Dynamics Group

University of Western Sydney



## MR measurements of molecular dynamics to characterize structure formation during phase transitions in the gelation of biopolymers

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### Abstract

This talk will address research on molecular dynamics in gels and polymer solutions using magnetic resonance (MR) measurements, including MR imaging, multidimensional relaxation correlation/exchange and displacement time dependent diffusion methods. The transport of solvent in natural and manufactured gels is of importance in a broad range of applications, ranging from biomedical, to food science, to understanding biofilms. Alginate hydrogels are a material in which a hierarchy of length and time scales are important in controlling material structure and transport related material function. The transport and distribution of water in alginate solutions and gels made from O-acetylated and non-acetylated alginates from microbial genetic variants demonstrate the impact of biomolecular structure on water dynamics and distribution as measured by MR methods. In diffusion front reaction gelation of alginates by cations, molecular dynamics during spontaneous mesoscale structure formation of capillaries is measured. The mass transport of the water and polymer during this capillary formation can be modeled using concepts from critical phase transition dynamics which combine thermodynamics and transport phenomena. Phase transitions during solvent evaporation drying of polymer solutions (*e.g.* HPMC) are important in pharmaceutical production processes. The use of MR to study transport and phase transitions during solvent drying provides unique data to address the connections between gelation and glass transitions.

### Profile

Joe Seymour is co-director of the Magnetic Resonance (MR) Laboratory and a Professor in the Department of Chemical and Biological Engineering at Montana State University. His research involves laboratory MR and MRI of the motion of fluid molecules in complex materials and field studies in Antarctica and Siberia. Dr Seymour is an international leader in application of MR methods to engineering systems and is a recipient of the Alexander von Humboldt Fellowship and the US NSF CAREER Award.

**Staff and students at all levels are welcome to attend.**

### Venue and Time:

This talk will be held on 4:00 pm on 28<sup>th</sup> October 2015 at the Campbelltown Campus in Building 9, Lecture Theatre 4 (CA-09.G.02).

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