The Australian Society Of Rheology, Inc.

2017 Rheology Lecture Series

CAV Reg. No. A0055806E

In 2017 the Australian Society of Rheology is presenting a national series of lectures, which is open to anyone interested in the flow and deformation of matter. The next event in the series will be held in **Sydney**.

Calendar details

Date:	**Wednesday, 19 April 2017**
Time:	16:00 to 18:00 PM
Venue:	**The University of Sydney** *Faculty of Engineering & IT* *Peter Nicol Russell (PNR) Building, Level 1, Lecture Theatre 1 (Farrell) (click for map)*

Invited lectures

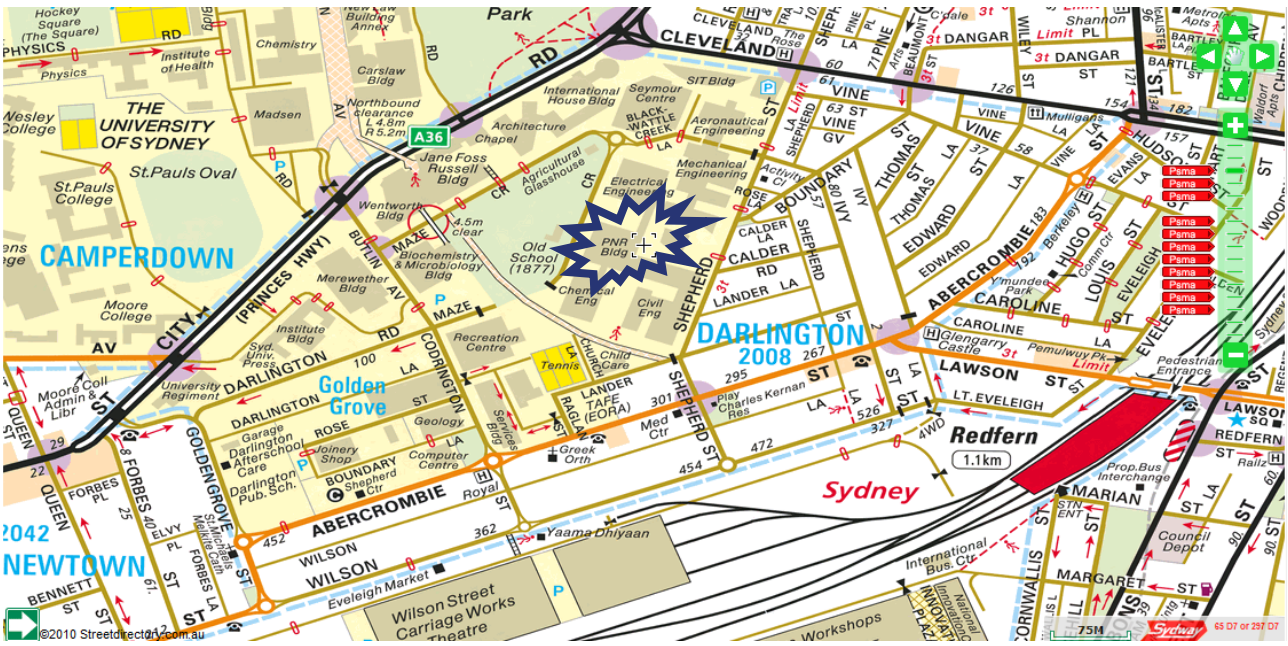
A/Prof. Patrick T. Spicer (Department of Chemical Engineering, UNSW)

"Microscale Yielding of Fibre Gels"

A/Prof. Chiara Neto (School of Chemistry, The University of Sydney; AINST)

"Direct Measurements of Interfacial Slip over Grafted Polymer Brushes"

To help with catering please RSVP by following the link* and registering for this *free* event.



* The link can also be accessed manually at
https://www.eventbrite.com.au/e/australian-society-of-rheology-2017-lectures-tickets-33296967125

Enquiries may also be directed to A/Prof. Ahmad Jabbarzadeh or Dr. David I. Verrelli.

Lecture 1:

A/Prof. Patrick T. Spicer (Department of Chemical Engineering, UNSW)

"Microscale Yielding of Fibre Gels"

Complex fluids have been studied and developed in many sectors of industry and medicine because of their unique rheological properties. Suspending colloidal particles with attractive interactions to form a network is a common way to impart a yield stress to a fluid. Large aspect-ratio cellulose nanofibers are able to a form poroelastic network at low volume fractions via aggregation and entanglement, forming a gel without significantly modifying viscosity. Such nanofiber gels have a small, but useful, yield stress and a better ability to suspend particles than higher volume fraction glasses. In this study, an active microrheology technique is used to study deformation and yielding of weak cellulose fibre gels. Microrheology coupled with confocal imaging shows how gel yield stress can be a strong function of the structural deformation rate because of localized network restructuring. Such response is advantageous to numerous applications like surface coatings, nasal sprays, cosmetics, and foods. Understanding the mechanism of rate- and length-scale dependent yielding, and relating microstructure changes to bulk rheology, will enhance our ability to formulate, model, and design complex fluids with novel performance.

Speaker's biography:

Patrick T. Spicer is an Associate Professor in the School of Chemical Engineering at the University of New South Wales in Australia. His research interests include complex fluids, microrheology, and novel emulsions. Before moving to academia, Pat led the Procter & Gamble Company's Microstructured Fluids Group for 15 years. He earned a BS from the University of Delaware and a PhD from the University of Cincinnati, both in chemical engineering.

Lecture 2:

A/Prof Chiara Neto (School of Chemistry, The University of Sydney; AINST)

"Direct Measurements of Interfacial Slip over Grafted Polymer Brushes"

The traditional assumption of a no-slip boundary condition at liquid–solid interfaces provides a good description of liquid flow on a macroscopic scale. However, on the microscopic scale a finite slip for simple liquids can be detected using high precision nano-scale techniques. The occurrence of interfacial slip is important in all situations where liquid flow is confined, such as in microfluidic and biological systems.[1,2]

For the past few years my group has investigated the boundary conditions for flow by measuring hydrodynamic drainage forces using the colloid probe Atomic Force Microscope (AFM). We have been able to provide new experimental data, an improved analysis protocol, and a new theoretical approach which overall greatly enhance the accuracy and reproducibility of the measured slip.[3-6]

The investigation of the flow of liquids in biological systems in particular requires the design of soft interfaces. Grafting polymer brushes is an ideal way to fabricate controlled soft interfaces, thanks to their versatile chemical functionality, and their switching of properties in reaction to stimuli. In this work the interfacial flow of a Newtonian liquid was investigated at the interface with densely grafted layers of polyethylene glycol, of two different chain lengths, obtained by grafting under marginal solvation conditions. The hydrodynamic force measurements confirm earlier molecular dynamics simulations[7] that the slip length can be interpreted as a penetration length, which accounts for flow within the top half of the polymer brush.[8]

References

1 Lee, Charrault, & Neto. *Adv. Colloid Interface Sci.* **210**, 21-38 (2014).
2 Neto, Evans, Bonaccurso, Butt & Craig. *Rep. Prog. Phys.* **68**, 2859-2897 (2005).
3 Zhu, Attard & Neto. *Langmuir* **27**, 6712–6719 (2011).
4 Zhu, Attard & Neto. *Langmuir* **27**, 6701–6711 (2011).
5 Zhu, Attard & Neto. *Langmuir* **28**, 3465-3473.
6 Zhu, Neto & Attard. *Langmuir* **28**, 7768–7774 (2012).
7 Lee, Hendy & Neto. *Macromolecules* **45**, 6241–6252 (2012).
8 Charrault, Lee & Neto. *Soft Matter* **12**, 1906-1914 (2016).

Speaker's biography:

Chiara Neto is Associate Professor in the School of Chemistry of the University of Sydney and Domain Leader in Molecular Nanoscience in the Australian Institute for Nanoscale Science and Technology. A/Prof Neto's research involves investigating the physico-chemical properties of liquid–solid interfaces on the nanoscale. Her projects involve soft matter interfaces, such as the surface wettability, pattern formation, and control of interfacial slip.

A/Prof. Neto received her Master's degree (1998) and PhD (2001) at the University of Florence. Her PhD work focused on direct measurements of surface forces and interfacial slip using atomic force microscopy. In 2002–2003 she worked at the University of Ulm and at Saarland University with Prof. Karin Jacobs on the dewetting of thin polymer films. In 2003–2006 worked at the Australian National University on nanorheology. In 2007 she moved to the University of Sydney, where she leads the Nano-Interfaces Lab within the Key Centre for Polymers and Colloids. She has co-authored approximately 60 publications, and has an *h*-index of 21. She is one of the Founding Directors and currently the President of the Australasian Colloids and Interface Society.