



THE UNIVERSITY OF
MELBOURNE

Mechanical Engineering

SEMINAR SERIES 2011

A/Prof. Gary Rosengarten

Head, Energy, Fluids and Environment
School of Mechanical Engineering
The University of NSW, Sydney

Thursday 27th January, 10am

Brown Theatre

Ground floor

Electrical & Electronic Engineering

Building 193

Using small-scale engineering to solve large-scale energy issues.

MORE INFORMATION

For more Mechanical Engineering seminar
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In this presentation I will look at three cases where micro and nano engineering can have a large impact on the energy efficiency of macro-scale systems.

Firstly, while solar thermal energy is essentially the leading source of renewable energy in the world through domestic water heaters, we are now starting to work on the next generation of systems to deliver more useful higher-temperature heat. I will discuss our work in developing a micro-solar collector that produces the heat required to reform a methanol/water mixture into hydrogen. This will power a micro PEM fuel cell. The energy required for reformation is attainable using solar energy alone, with the use of vacuum insulation and state-of-the-art selective surfaces.

Secondly, I will discuss the effect of superhydrophobicity on convective heat transfer rates. While the apparent slip and associated pressure drop reduction for superhydrophobic surfaces is relatively well documented, there is little data on the effect of superhydrophobicity on heat transfer. Our research shows that superhydrophobic surfaces significantly reduce the convective heat transfer rate relative to that for flat hydrophilic surfaces, thus paving the way for devices with considerably lower parasitic energy losses.

Finally, membrane filtration suffers from very high energy usage associated with pumping water through the membrane pores. We are looking at diatoms: singular cellular marine organisms with amazing self-assembled silica nanostructures. Understanding their structure will allow us to develop membranes with better performance. I will discuss their unique properties, and the effect that their structure has on the local fluid mechanics, and possible new low energy filtration mechanisms.