



**MONASH** University

**Department of Chemical Engineering**

**SEMINAR**

# **Osmotic Propulsion: The Osmotic Motor.**

**Presented by John F. Brady**

**Chevron Professor of Chemical Engineering**

Division of Chemistry & Chemical Engineering and Engineering & Applied Science,  
California Institute of Technology, Pasadena, CA 91125.

**Thursday 3rd April 2008, Building 36, Room 222.**

**4 – 5pm.**

**Abstract:**

A model for self-propulsion of a colloidal particle – the osmotic motor – immersed in a dispersion of colloidal ‘bath’ particles is presented. The non-equilibrium concentration of bath particles induced by a surface reaction creates an ‘osmotic pressure’ imbalance on the motor causing it to move to regions of lower concentration. The departure of the bath particle concentration from equilibrium is characterized by the ratio between the surface reaction velocity and the diffusion velocity. The computed bath particle concentration distribution is used to calculate the driving force on the motor, from which the self-induced osmotic velocity is determined via application of Stokes drag law.

For slow reactions the self-propulsion is determined by the reaction velocity. When surface reaction dominates over diffusion the osmotic velocity cannot exceed the diffusive speed of the bath particles. The implications of these features for different bath particle volume fractions and particle sizes are discussed. Theoretical predictions are compared with Brownian Dynamics simulations.

Inquiries to Dr Gareth Forde ([gareth.forde@eng.monash.edu.au](mailto:gareth.forde@eng.monash.edu.au))