

# THE CRM APPLIED MATHEMATICAL AND PHYSICS (CAMP) SEMINARS



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## **Application of asymptotic methods to industrial problems**

### **Abstract:**

This talk will focus on two distinct industrial problems where small dimensionless parameters appear naturally in the governing models. Asymptotic analysis is applied to formulate approximate solutions.

### **Problem 1:**

A cone and a plate rheometer is a laboratory device used to find the viscosity and other related parameters of a non-Newtonian liquid subject to an applied force. The profile of a static liquid drop, of order millimeters, located between the horizontal plate and the shallow cone of the rheometer is considered. The free liquid surface in equilibrium is given by the solution to the well-known Young-Laplace equation which describes a physical balance between the liquid surface tension and the pressure differential across the liquid-air interface. A perturbation approach, based on small Bond number, is used to solve the non-linear Young-Laplace equation and demonstrate the rich asymptotic drop structure.

**Problem 2:** Spin-coating is a commonly used technique for coating substrates whereby a liquid suspension on a rotating substrate thins via the centrifugal force and evaporation. Via lubrication theory, the well-known spin-coating model is derived. Based on small evaporation a formal asymptotic approach is used to attain expressions for the film height which improves on previous spin-coating approximations.

**Date:** Tuesday, October 15, 2013

**Place:** Room C1/028

**Time:** 12:00

