



Numerical Mathematics and Applied Analysis Group Seminar (NMAA)

Professor Anita Layton
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May 5, 2010 (Wednesday)
Room 210, Run Run Shaw Building, HKU

Lecture 1: Feedback dynamics in the rat kidney

10:30 – 11:30am

Abstract: The mammalian kidney plays a fundamental role in maintaining whole-organism chemical and physical stability. The kidney maintains the electrolyte concentrations, osmolality, and acid-base balance of blood plasma within the narrow limits that are compatible with effective cellular function; and the kidney participates in blood pressure regulation and in the maintenance of steady whole-organism water volume. The rate of filtration is regulated by multiple mechanisms. Among the most important of these mechanisms is the tubuloglomerular feedback (TGF) system, a negative feedback loop in which the chloride ion concentration is sensed downstream and the muscle tension in the afferent arteriole is modified according to the difference between the sensed concentration and a target concentration. In this work, we seek to elucidate the causes of irregular tubular flow oscillations found in the nephrons of spontaneously hypertensive rats. We have conducted a bifurcation analysis of a mathematical model of two nephrons that are coupled through their TGF systems. Four potential sources of spectral complexity were investigated: Variations in TAL permeability, alterations in TGF system time-delays, vascular coupling between nephrons, and temporal variation in key system parameters.

Lecture 2: An introduction to postgraduate study in Mathematics at Duke University

3:00 – 4:00pm

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All are welcome
