
MMAE SEMINAR

WEDNESDAY, APRIL 6, 2005
E-1 BUILDING – CRAWFORD AUDITORIUM
3:30 – 4:30 PM

Biomechanics of soft biological tissue: structure and modeling

Professor Ray Ogden
University of Glasgow
e-mail: rwo@maths.gla.ac.uk

Abstract

In order to understand mechanical factors associated with, for example, the onset of aneurysms or atherosclerosis in arteries and for investigating changes in the arterial system due to age, hypertension and atherosclerosis it is essential to have available suitable constitutive models for the description of the mechanical response of the material of the artery wall. It is generally accepted that this material can be regarded as incompressible and anisotropic (specifically, orthotropic), and that its stress-strain response is highly nonlinear. It is now well known that the load-free configuration of an artery is not stress free. This is illustrated by the springing open of a radially cut arterial ring to form an open sector. The residual stress has a crucial influence on the response of the artery and on the stress and strain distributions through the arterial wall. In this talk, we develop a simple representation for the extension-inflation response of a thick-walled circular cylinder that can take account of histological information concerning the orientation of collagen fibres in the layers of the arterial wall. On the basis of the nonlinear theory of elasticity, we examine a possible model for describing the influence of residual stress on the nonlinear elastic response of arterial walls.