COLLOQUIUM
UNIVERSITY OF PITTSBURGH
FRIDAY, OCTOBER 3, 2008

704 THACKERAY HALL

4:00 P.M.

PROFESSOR RAZ KUPFERMAN

INSTITUTE OF MATHEMATICS

THE HEBREW UNIVERSITY

NON-EUCLIDEAN PLATES

ABSTRACT: The classical literature on thin elastic bodies deals primarily with two types of bodies—plates and shells. Mathematically, a plate can be viewed as a continuous stack of identical flat surfaces glued together, whereas a shell can be viewed as a continuous collection of non-identical (and not necessarily flat) surfaces glued together. The term non-Euclidean plate was recently introduced to describe thin elastic bodies which, like plates, do not exhibit structural variations across their thin dimension, and yet, unlike plates, do not have a planar rest configuration. Such elastic bodies can neither be described as shells, which bear structural variations across their thin dimension, and possess curved stress-free rest configurations. Non-Euclidean plates exhibit residual stresses even in the absence of external constraints, and are therefore inherently frustrated. Bodies of such type are ubiquitous in biology, e.g., plant leaves and other growing tissues, and are being manufactured in the laboratory.

In this lecture I will derive an elastic model for describing such bodies, and describe some of its mathematical properties, such as the so-called buckling transition, the convergence to an isometric immersion in the zero-thickness limit, and the appearance of a boundary layer at small, yet finite thickness.

This is joint work with Efi Efrati and Eran Sharon from the Institute of Physics at the Hebrew University.

Refreshments served at 3:30 p.m.
in the Math Dept. COMMON ROOM, Thackeray 705