

COLLOQUIUM
UNIVERSITY OF PITTSBURGH
FRIDAY, DECEMBER 5, 2008
704 THACKERAY HALL
4:00 P.M.

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AN INVITATION TO n -HARMONIC HYPERELASTICITY

ABSTRACT: Quasiconformal geometry and nonlinear elasticity theory share common problems of compelling mathematical interest. Both theories are governed by specific energy integrals together with their associated Lagrange-Euler equations. The mappings of particular interest (elastic deformations) are the ones with smallest energy. In this talk I will present our latest advances concerning existence, global injectivity (the principle of non-penetration of matter) and boundary behavior of deformations of smallest n -harmonic energy, a prototype of the planar Dirichlet integral. This brings us to polyconvex variational integrals for the distortion of the inverse mapping. Distinctly, the inverse of the extremal mapping turns out to minimize the L^1 -norm of its own distortion function, among all homeomorphisms in a given homotopy class (very much reminiscent of the Teichmüller extremal problems). The great virtue of all our energy integrals is that they are invariant under conformal change of variables. For this reason we call such a theory Quasiconformal Hyperelasticity. Our approach offers significantly larger class of mappings than Quasiconformal Geometry. Interplay between nonlinear analysis and topology is critical. In particular, the underlying integration of rather special nonlinear differential expressions (called free Lagrangians) becomes truly a work of art. This talk will be accessible to graduate students in analysis. Report on joint work with Jani Onninen.

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