# COLLOQUIUM

# UNIVERSITY OF PITTSBURGH

# FRIDAY, SEPTEMBER 14, 2007

# 704 THACKERAY HALL

# 4:00 P.M.

**SPEAKER: PROFESSOR YURY GRABOVSKY**

**DEPARTMENT OF MATHEMATICS**

**TEMPLE UNIVERSITY**

**ABSTRACT:** The vectorial variational problem refers to the variational functional involving multiple integrals, where the unknown is a vector field. Such problems arise naturally in the context of non-linear elasticity and modeling of shape memory materials. The field theory of Weierstrass and Caratheodori provides a method by which one can prove that a given solution of the Euler-Lagrange equation is a strong local minimizer. At some point it became clear that the field theory approach cannot possibly provide the vectorial analog of the Weierstrass sufficiency theorem for vectorial variational problems. We prove such analog by studying the effect of an arbitrary strong variation on the value of the functional. The key tool is the recently developed Decomposition Lemma, first proposed by Jan Kristensen (1994), that permits us to split the variation into the purely strong and weak part. We show that the two parts of the variation act on the functional independently (orthogonality principle). Positivity of second variation ensures that the weak part cannot decrease the functional, while the quasiconvexity conditions (the vectorial analog of the Weierstrass convexity condition) ensure that the strong part is unable to decrease the functional either. The latter part is accomplished by means of the localization principle. The use of the three key components of our analysis: the Decomposition Lemma, the orthogonality and localization principles were inspired by the work of Fonseca, Mueller and Pedregal (1998).

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