1010-35-91 **David Yang Gao*** (gao@vt.edu), Department of Mathematics, Virginia Tech, Blacksburg, VA 24061. *Canonical Duality Theory and Algorithm for Solving Semi-Linear Nonconvex Variational/PDE Systems with Applications.*

Nonconvex variational/boundary value problems appear naturally in many applications, such as chaotic dynamics, phase transitions of modern materials, and certain biological processes like DNA dynamics, etc. Due to the nonconvexity of the total potential energy of the system concerned, traditional analysis and related numerical methods for solving these problems have proven to be very difficult, or even impossible.

In this talk, the speaker will present a potentially powerful canonical dual transformation method and the associated triality theory for solving a large class of nonconvex variational/PDE problems. He will show that by using this method, many nonlinear differential equations can be transformed into dual algebraic system,and a large class of semi-linear nonconvex variational problems are actually equivalent to the so-called DAEs (differential-algebraic equations). The very interesting triality theory discovered recently can be used to control the chaotic behavior of the nonconvex systems, and to identify both global minimizer and local extrema. Based on this triality theory, a powerful primal-dual algorithm is suggested. Applications will be illustrated by nonconvex problems in phase transitions governed by Landau-Ginzburg equation. (Received August 22, 2005)