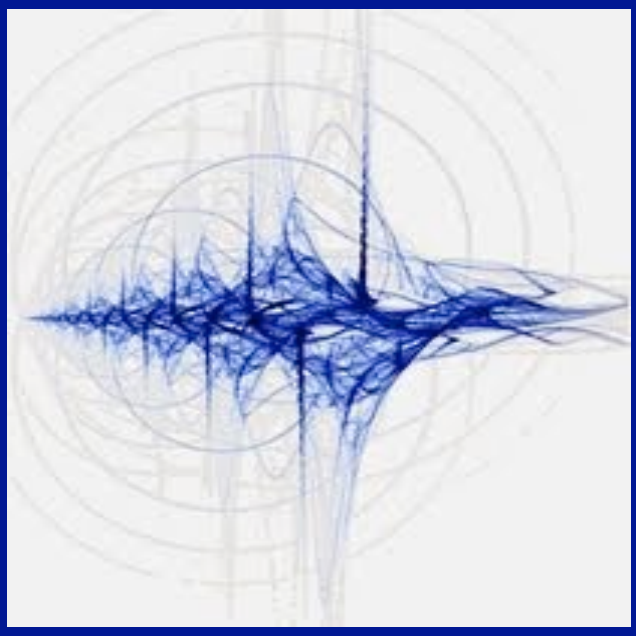
UCCS Department of Mathematics

Math Colloquium Series

DIONYSSIS MANTZAVINOS

SUNY BUFFALO



DATE:
MARCH 3, 2016

TIME:
12:30PM-1:30PM
(REFRESHMENTS AT 12:15PM)

LOCATION:
OSBORNE CENTER
ROOM# A327

INITIAL VALUE PROBLEMS AND INITIAL-BOUNDARY VALUE PROBLEMS FOR NONLINEAR EVOLUTION EQUATIONS

Abstract: Nonlinear evolution PDEs are a central topic in mathematical research, not only due to their inner beauty and complexity but also thanks to their broad range of real-world applications, from physics and biology to finance and economics. The first part of this talk is devoted to a new approach developed in collaboration with A.S. Fokas and A. Himonas for the well-posedness of initial-boundary value problems for such PDEs in one spatial dimension. In particular, it is shown that the nonlinear Schrodinger (NLS) and the Korteweg-de Vries (KdV) equations are well-posed on the half-line with data in appropriate Sobolev spaces. The second part of the talk is concerned with the initial value problem for a nonlocal, nonlinear evolution PDE of Camassa-Holm type with cubic nonlinearity, which is integrable, admits periodic and non-periodic multi-peakon traveling wave solutions, and can be derived as a shallow water approximation to the celebrated Euler equations. Finally, the third part of the talk addresses a long-standing open question, namely the nonlinear stage of modulational instability (a.k.a. Benjamin-Feir instability), which is one of the most ubiquitous phenomena in nonlinear science. For all those physical systems governed by the focusing NLS equation, a precise characterization of the nonlinear stage of modulational instability is obtained by computing explicitly the long-time asymptotic behavior of the relevant initial value problem formulated with nonzero boundary conditions at infinity