UNIVERSITY OF SASKATCHEWAN

DEPARTMENT OF
MATHEMATICS AND STATISTICS

COLLOQUIUM ANNOUNCEMENT

Place: THORV 159

Date and Time: Friday, April 12, 3:30 pm to 4:30 pm

Speaker: Prof. Maciej Nowak (Jagiellonian University, Poland)

Title: Shock waves and critical phenomena in dynamic random matrix models

Abstract:

We obtain several classes of non-linear partial differential equations for various random matrix ensembles undergoing Brownian type of random walk.

These equations for spectral flow of eigenvalues as a function of dynamical parameter ("time") are exact for any finite size N of the random matrix ensemble and resemble viscid Burgers-like equations known in the theory of turbulence. In the limit of infinite size of the matrix, these equations reduce to complex inviscid Burgers equations, proposed originally by Voiculescu in the context of free processes. We identify spectral shock waves for these equations in the limit of the infinite size of the matrix, and then we solve exact, finite N nonlinear equations in the vicinity of the shocks, obtaining in this way universal, microscopic scalings equivalent to Airy, Bessel and cuspoid kernels. We link observed spectral universalities to several critical phenomena in theoretical physics.