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## **HKMS Distinguished Lecture**

Superfluid Passing an Obstacle and Vortex Nucleation

**Professor Fanghua Lin** 



- Date : 1 December 2017 (Friday)
- Time : 16:30 17:30
- Venue : F.A.M. Lecture Theatre (LT-8), 4/F, Yeung Kin Man Academic Building, City University of Hong Kong

## Abstract

The problem of a classical compressible and irrotational fluid passing an obstacle was well-known and studied by many. Roughly speaking, when the velocity of the fluid is small, the flow would be smooth and nothing much would occur (subsonic regime). When the fluid velocity is very large, there are shocks and the fluids become rather turbulent and mathematically it is not easy to understand (supersonic regime). In between, there is a critical speed (at infinity) at which the fluid reach the maximum speed (sound speed for the fluid) on the boundary of the obstacle. Since a superfluid by the definition is frictionless, hence it would not develop shocks. On the other hand, formal arguments imply that the long-wave approximations of superfluid flows (semiclassical limits) would be a classical flow described by the compressible Euler equations. The latter may develop shocks however. A natural question is: what would really happen to the superfluid flows, and how one would explain it then? Reasonings from physics which are supported by numerical simulations, lead to the phenomena of the vortex nucleation and the vortex shedding. The aim of this talk is to present some recent rigorous mathematical analysis on these issues.

## Biography

Professor Fanghua Lin is a Julius Silver Professor at Courant Institute of Mathematical Sciences, New York University. He was also a Professor at University of Chicago in 1988-1989 and 1996-1997. He received his PhD from University of Minnesota in 1985, and was awarded the Presidential Young Investigator and the Alfred P. Sloan Fellow in 1989, AMS Bocher Prize in 2002, and S.S. Chern Prize at ICCM in 2004. His current interests include classical & applied analysis, partial differential equations, geometric measure theory, and calculus of variations.

He is the author of many papers and several books, including Elliptic Partial Differential, Geometric Measure theory: An Introduction, and The Analysis Of Harmonic Maps And Their Heat Flows. Professor Lin is a member of the American Academy of Arts and Sciences (2004), and a fellow of the American Mathematical Society (2015).