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Z.P. Xin, Chinese University of Hong Kong

S.T. Yau, Harvard University

Section 5: October 2020

Time: October 08, 15:00-16:00 PM (Beijing time) Lecture No. 20201008-17			
Lecture website (zoom): https://zoom.com.cn/j/69148274109 **ID:** 69148274109 **Password:** 20201008			
Speaker	Sergey Igorevich Kabanikhin	**Affiliation**	the Institute of Computational Mathematics and Mathematical Geophysics, Siberian Branch of the Russian Academy of Sciences
Title: Mathematical Problems Driven by Covid-19			
Abstract: We discuss and analyse several mathematical problems which occur to be very actual during the epidemy of Covid-19, including inverse problems, optimization, big data analyses, neural networks and mean field games. We will describe SEIR-type models and agent models. The propagation of COVID-19 has significant spatial characteristic. Actions such as travel restrictions, physical distancing and self-quarantine are taken to slow down the spread of the epidemic. It seems to be very important to have a spatial-type SIR model to study the spread of the infectious disease and movement of individuals. Since the epidemic has affected the society and individuals significantly, mean-field games provide a perspective to study and understand the underlying population dynamics. We describe a mean-field game model for controlling the virus spreading within a spatial domain. The goal is to minimize the number of infectious agents and the amount of movement of the population.			
Short Bio: Sergey Igorevich Kabanikhin is a corresponding member of Russian Academy of Sciences. He is currently the chief research scientist of the Institute of Computational Mathematics and Mathematical Geophysics, Siberian Branch of the Russian Academy of Sciences, the chief research scientist of Laboratory of Wave Processes of Sobolev Institute of Mathematics SB RAS, and a full professor of Novosibirsk State University and the head of the chair of Mathematical Methods of Geophysics. Prof. Kabanikhin received his B.S. and M.S. from Novosibirsk State University, and Ph.D. from Siberian Branch of Russian Academy of Science			

in 1978. His research interests include inverse and ill-posed problems, integral and differential equations, inverse problems of mathematical physics, inverse problems in geophysics, etc. Prof. Kabanikhin has done significant research works and published more than 110 papers and 12 books. Now Prof. Kabanikhin is the Editor-in-Chief of <Journal of Inverse and Ill-posed Problems> and <Numerical Analysis and Applications>.

Time: October 15, 8:00-9:00 AM (Beijing time) Lecture No. 20201015-18

Lecture website (zoom): https://zoom.com.cn/j/67071127703

ID: 67071127703 **Password:** 20201015

Speaker	Zhouping Xin	**Affiliation**	Chinese University of Hong Kong

Title: Free Interface Problems for The Incompressible Inviscid Resistive MHD

Abstract: In this talk I will discuss the global well-posedness of free interface problems for the incompressible inviscid resistive MHD. Both plasma-vacuum and plasma-plasma interface problems in a horizontally periodic slab impressed by a uniform transversal magnetic field will be studied. The global well-posedness of both problems with suitable boundary conditions around the equilibrium is established, and the solutions are shown to decay almost exponentially to the equilibrium. The results reveal the strong stabilizing effects of the transversal magnetic field. One of the key observations here is an induced damping structure for the fluid vorticity due to the resistivity and tranversallity of the magnetic field. This is a joint work with Yanjin Wang.

Short Bio: Dr. Zhouping Xin is currently the executive director of The Institute of Mathematical Sciences and William M. W. Mong Professor of Mathematics of The Institute of Mathematical Sciences and Department of Mathematics, Chinese University of Hong Kong. He received his B.S. and M.S. in mathematics from Northwestern University, and his Ph.D. in Mathematics from University of Michigan in 1988. Prof. Xin's main research interests include partial differential equations, fluid dynamics, mathematical physics, etc. He has done significant research works and published many research papers in top quality international journals. Prof. Xin is the Co-Editor-in-Chief of the journal <Methods and Applications of Analysis> since 1998, and editorial board members or associate editors for more than 10 journals. He was awarded the Qin Yuan Sun Mathematical Award in 2019, the Distinguished Paper Award (Silver), International Consortium of Chinese Mathematicians in 2017, and Morningside Gold Medalist in Mathematics, International Congress of Chinese Mathematicians in 2014, etc.

Time: October 22, 8:00-9:00 AM (Beijing time) Lecture No. 20201022-19

Lecture website (zoom): https://zoom.com.cn/j/66839430615

ID: 66839430615 **Password:** 20201022

Speaker	Leslie Greengard	**Affiliation**	New York University, USA

Title: Linear and nonlinear inverse problems in imaging

Abstract: Inverse problems arise routinely in imaging and structure determination using a variety of experimental modalities. After an overview of numerical aspects of medical imaging, we will consider inverse acoustic scattering and protein structure determination from cryo-electron microscopy data (cryo-EM). These are computationally intensive tasks that are typically formulated as non-convex optimization problems. In cryo-EM, the raw data is extremely noisy and existing methods are generally based on some version of maximum likelihood estimation, with a low resolution starting guess. In inverse acoustic scattering, the underlying physical problem is ill-posed and requires both regularization and high-order methods to solve a sequence of forward scattering problems. We will present some algorithms for accelerating image reconstruction in all these settings, illustrate their performance with several examples, and discuss open problems in the field.

Short Bio: Leslie Greengard received his B.A. degree in Mathematics from Wesleyan University in 1979, and his Ph.D. degree in Computer Science and M.D. degree from Yale University in 1987. He has been a member of the faculty at the Courant Institute of Mathematical Sciences, NYU since 1989, and was Director of the Institute from 2006-2011. He is also Professor of Electrical and Computer Engineering at NYU's Tandon School of Engineering, and presently serves as Director of the Center for Computational Mathematics at the Flatiron Institute, a division of the Simons Foundation. Greengard, together with V. Rokhlin, developed the Fast Multipole Method (FMM) for problems in gravitation, electrostatics and electromagnetics. For their work, in 2001 they received the Steele Prize from the American Mathematical Society. Much of Greengard's research has been aimed at the development of high-order accurate integral equation based methods for partial differential equations in complex geometry. He is a member of the National Academy of Sciences, the National Academy of Engineering, and the American Academy of Arts and Sciences.