Abstract:  Generalizations of Combinatorial Hodge Theory and Gromov-Witten Theory

June Huh was recently awarded a Fields Medal for his work on the development of "Combinatorial Hodge Theory," allowing one to use techniques of algebraic geometry to solve a number of long-standing conjectures in combinatorics. Gromov-Witten Theory was developed in the 1990s as a tool for counting curves on algebraic varieties using ideas inspired by physics. I will describe how one might ambitiously hope to use generalizations of Combinatorial Hodge Theory to develop higher-dimensional generalizations of Gromov-Witten Theory. (No prior knowledge of either of these topics will be necessary.)

Numerical methods for stochastic Stokes and Navier-Stokes equations

Navier-Stokes and Stokes equations are one of the most well-known equations in fluid mechanics because of their broad applications. In this colloquium, I will introduce the stochastic versions of these equations. It is well-known that the stochastic Navier-Stokes and Stokes equations are used for a better understanding of turbulence and also thermodynamic fluctuations present in fluid flows. We will focus on the numerical methods to solve the stochastic Navier-Stokes and Stokes
equations. I will introduce the two popular methods that are Euler-Maruyama-mixed finite element method and Chorin projection method for solving these equations. For each case, error estimates are also addressed and analyzed.