课程题目： *Geometric Fluid Dynamics*

主 讲 人： **Prof. Dr. Boris Khesin**

单 位： University of Toronto

时 间： 9月14日-10月7日
每周二、四8:30am-10:00am

ZOOM ID： 567 306 5241

密 码： 123456

摘 要： The course outlines group-theoretic, geometric, and topological approaches to hydrodynamics. We start by describing the Eulerian dynamics of an ideal fluid and the Korteweg-de Vries equation of shallow water from the group-theoretic and Hamiltonian points of view. We move on to cover the geometry of Casimirs for the Euler equation and helicity of vector fields. The Hamiltonian framework will also allow us to recover the motion of point vortices, vortex filaments and membranes. Finally, we will relate the differential geometry of diffeomorphism groups to problems of optimal mass transport.

Prerequisites: Some acquaintance with basic notions of Lie groups and symplectic geometry is recommended.

Reference: V. Arnold and B. Khesin "Topological methods in hydrodynamics", Second extended edition, Springer-Nature, 2021, 455pp.

Seminar for general math audience: "The mystery of pentagram maps"

课程安排：

9月14日	Introducing the Euler equations. Its description as the geodesic flow.
9月16日	Equations on the dual Lie algebra, Lie-Poisson structures.
9月21日	Virasoro algebra and the KdV as an Euler equation.
9月23日	The Hamiltonian framework for the hydrodynamic Euler equation.
9月28日	Conservation laws for fluids.
9月30日	Helicity of a vector field.
10月5日	Point vortices in 2D, vortex filaments and membranes.
10月7日	Geometry of diffeomorphism groups and optimal mass transport.

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