



MAFIA - the seminar you can't refuse

## **Leapfrogging and scattering of point vortices**

**Roy Goodman**

New Jersey Institute of Technology

January 27, 2026, 12:00–13:00 in T208

Fakulta jaderná a fyzikálně inženýrská ČVUT  
Trojanova 13, 12000 Praha

**Abstract:**

The interaction among vortices is a key process in fluid motion. The  $n$ -vortex problem, which models the movement of a finite number of vortices in a two-dimensional inviscid fluid, has been studied since the late 1800s and remains relevant due to its strong link to quantum fluid dynamics. A foundational document in this area is Walter Gröbli's 1877 doctoral dissertation. We apply modern tools from dynamical systems and Hamiltonian mechanics to several problems arising from this work. First, we study the linear stability and nonlinear dynamics of the so-called leapfrogging orbit of four vortices, utilizing Hamiltonian reductions and a numerical visualization method known as Lagrangian descriptors. Second, we derive a new set of coordinates for a system of three vortices using tools from geometric mechanics. We use this to analyze the scattering of vortex dipoles and classify the global dynamics.