

LadHyX Seminar – September 16, 14:00

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Orderly formations and traveling waves exhibited by schooling wings

The beautiful displays exhibited by fish schools and bird flocks have long fascinated scientists, but the role of their complex behavior remains largely unknown. In particular, the influence of hydrodynamic interactions on schooling and flocking has been the subject of intense debate in the scientific literature. I will present a model for flapping wings in orderly formations, with the goal of identifying the formations for which swimmers optimally benefit from hydrodynamic interactions. I will then outline a framework for finding exact solutions to the evolution equations and for assessing their stability, giving physical insight into the preference for certain observed "schooling states." The model predictions agree well with experimental data on freely-translating, flapping wings in a water tank. The model is then used to develop a one-dimensional continuum theory for a dense flock, which exhibits traveling wave solutions. Generally, our results indicate how hydrodynamics may mediate schooling and flocking behavior in biological contexts.