Webinar

Applied mathematics in vorticity and vortex dynamics

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Vorticity and vortex dynamics is an important subfield of fluid dynamics. It is an interdisciplinary science at the intersection of mathematics, physics, engineering, and sometimes biology. I will start this talk by introducing the field and its importance. I will then give an overview of results in a couple of problems that I have worked on, namely compressible vortex dynamics and exact solutions of the steady incompressible Euler equation, both in two-dimensions. Results include a formula for the correction due to compressibility to the speed of the incompressible von Karman point vortex street, and an analysis of finite-area effects when the point vortices are replaced by hollow vortices leading to free boundary problems. We have uncovered new exact solutions of the steady incompressible Euler equation, which we call "Liouville links and chains". These involve point vortices embedded in a background sea of smooth vorticity described by the Liouville PDE; examples include iterated solutions given in terms of the Adler--Moser polynomials arising in KdV theory.

Thursday, Aug 12th 2021

4:00 PM