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Nonholonomic Mechanics and Fluid-Body Interactions SCOTT KELLY, PHANINDRA TALLAPRAGADA, University of North Carolina at Charlotte — Certain velocity constraints arising in idealized models for fluid-body interactions, including the Kutta condition classically applied at the trailing cusp of a Joukowski hydrofoil experiencing lift, are formally equivalent to nonintegrable constraints arising in the mechanics of finite-dimensional mechanical systems. This equivalence allows hydrodynamic problems involving vortex shedding and related phenomena to be framed in the context of geometric mechanics on manifolds, and for essential mechanisms of biomorphic aquatic propulsion to be interpreted in terms of symmetry-breaking and generalized momentum equations. We illustrate this perspective using simple examples that highlight parallels between the finite- and infinite-dimensional cases.

Scott Kelly
University of North Carolina at Charlotte

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