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Comparing a Rayleigh-Taylor Unstable Flame to a Circular Cylinder ELIZABETH HICKS, University of Chicago/ Northwestern University — Rayleigh-Taylor unstable, premixed flames show different types of behavior depending on the value of the gravitational force. We present the results of two-dimensional numerical simulations of the flame for various values of gravity. If gravity is relatively small, the flame forms a cusped shape. The cusped flame produces stable shear layers, or rolls, behind the flame. For slightly higher values of gravity, the rolls become unstable and vortex shedding begins far behind the flame front. We show that the development of this vortex shedding behavior can be described by the Landau equation and can be represented dynamically by a Hopf bifurcation. This behavior is analogous to the initial instability behind a circular cylinder, which leads to the von Karman vortex street for large enough values of the Reynolds number. The applicability of the Landau equation allows the apparently complex spatio-temporal characteristics of the vortex shedding to be simply described temporally with only a secondary spatial dependence.

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