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A cantilevered flexible cylinder in cross-flow[1] JESSICA SHANG, ALEXANDER SMITS, HOWARD STONE, Princeton University — Biological fluid-structure interactions of high aspect ratio bluff bodies are commonplace: flow around tall plants; flow through arrays of sensory vibrissae, antennae, and hairs. In this study, we seek insight to this class of problems by generalizing the flow configuration to uniform flow past a flexible cantilevered cylinder. Experiments were conducted for Re_D = 100-500. Cylinders deflected with the flow and demonstrated multimodal oscillations in both the streamwise and transverse directions. Oscillation frequencies were correlated with vortex shedding frequencies, but low oscillation frequencies (sub-1 Hz), which were not apparently vortex- induced, were also present. Two Re_D regimes were noted in which the vortex shedding frequency remained relatively constant with Re_D,while the two regimes were separated by an intermediate transition region. This feature results in an apparently linear relationship between St and Re_D in each regime. Hydrogen bubble visualization showed strong three-dimensionality in the wake, as well as a diversity of wake structures varying with Re_D.

[1]NSF-GRFP

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