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Cyclical wake mode-switching for a heated cylinder oscillating in cross flow[1] TAIT POTTEBAUM, University of Southern California, MORY GHARIB, California Institute of Technology — For an unheated, transversely oscillating circular cylinder in cross flow, the wake mode is determined by the period and amplitude of the oscillations [1]. Other than a possible single transition associated with startup conditions [2], the wake mode remains fixed if the oscillation amplitude and period are constant. In contrast, experiments with heated cylinders have revealed cyclical switching between distinct wake modes. The mechanism of this mode-switching has been identified, with temperature induced variations in the boundary layer viscosity playing a critical role. This discovery exposes the role of viscosity in determining wake mode and may lead to an improved understanding of vortex formation and pinch-off processes for wakes in general.

References:
[1] C.H.K. Williamson, A. Roshko, 1988. "Vortex formation in the wake of an oscillating cylinder," Journal of Fluids and Structures, 2, pp. 355-381.
[2] J. Carberry, J. Sheridan, D. Rockwell, 2001. "Forces and wake modes of an oscillating cylinder," Journal of Fluids and Structures, 15(3-4), pp. 523-532.

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