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**New phenomena in Vortex-Induced Vibrations** CHARLES WILLIAMSON, Cornell University — In this presentation, we summarize phenomena concerning vortex-induced vibration (VIV), that have been discovered over the last few years (Williamson & Govardhan, *Annual Review of Fluid Mechanics*, 2004). We pay special attention to vortex dynamics and energy transfer that give rise to modes of vibration. We present new vortex wake modes from different configurations (e.g., involving 2 degrees-of-freedom, tethered bodies, pivoted bodies, or freely-falling bodies) often in the framework of the Williamson-Roshko (1988) map of vortex modes. New modes include the formation of vortex triplets, co-rotating vortices and vortex rings. We have discovered a generic phenomenon in VIV whereby a body can resonate even as flow velocities become infinitely large, i.e. as vibration frequency, f >> natural frequency, fN, very different from classical resonance, where f $\sim$ fN. This is only possible if the body mass falls just below a critical value. Correspondingly, we find that freely rising bodies will only vibrate, if their relative density falls below a critical value. Finally, we throw light on the large unexplained scatter found in the classical Griffin plot (peak amplitudes vs. mass-damping) over the last 30 years. We discover that the amplitude is influenced by Reynolds number, (see also Klamo, Leonard and Roshko, 2005). We then renormalise existing data and find a beautiful collapse of data in a "modified" Griffin plot. We gratefully acknowledge the support of the ONR, monitored by Tom Swean (Contract No. N00014-04-1-0031)

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