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Experiments on Laminar to Turbulence Transition and Relaminarization in Pulsatile Flows JOAN GOMEZ, The City College of New York , OLEG GOUSHCHA, Manhattan College, YIANNIS ANDREOPOULOS, The City College of New York — Biological flows display laminar-turbulence-laminar transitions due to the cyclic nature of a beating heart. Addressing the question of how turbulence appears, decays and is suppressed in the cardiovascular system, particularly in the large arteries, is challenging due to flow unsteadiness, very complicated geometry and flow-wall interaction. In the present work we have designed and tested a facility to simulate unsteady pulsatile flows and the onset of transition under varying Reynolds and Womersley numbers. A moving piston is used to generate a flow pulsation and control the velocity amplitude. Time-Resolved Particle Image Velocimetry (TR-PIV) techniques were used to acquire velocity data on the plane of a CW laser illumination. Two different decompositions were applied to analyze the non-stationary and non-linear time-dependent data, the Empirical Mode Decomposition (EMD) and the Trend Removal Method (TRM). Two flow regimes were found, one in which the pulsatile flow exhibits phase-locked turbulence which is associated with the stabilizing effects of longitudinal straining during acceleration and a second where transition occurs very close to the wall while the core remains laminar.

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