Abstract Submitted
for the DFD12 Meeting of
The American Physical Society

Bifurcations in bifurcations: a dynamical analysis of an impacting T-junction flow[1] KEVIN CHEN, CLARENCE ROWLEY, HOWARD STONE, DANIELE VIGOLO, Princeton University, STEFAN RADL, Graz University of Technology — Pipe bifurcations are a common flow configuration, for instance, in industrial systems and blood vessels. The impacting flow through a T-junction can cause corrosion, damage, and even aneurysms. To complement ongoing particle-laden flow physics research on this geometry, we perform a local bifurcation analysis of the steady-state Navier–Stokes solutions. We carry out numerical continuation on the Reynolds number, using a combination of linear extrapolation and the Newton-GMRES algorithm. A supercritical pitchfork (i.e., symmetry-breaking) bifurcation occurs at $Re \approx 410$, at which the pair of counter-rotating vortices in the outflow pipes becomes asymmetric. A supercritical Hopf bifurcation occurs at $Re \approx 540$, at which the asymmetric steady-state solution becomes unstable, and a stable periodic orbit grows out of this equilibrium.

[1]Supported by the DOD NDSEG fellowship and the NSF GRFP.

Kevin Chen
Princeton University

Date submitted: 03 Aug 2012 Electronic form version 1.4