More on the asymptotic state of high Reynolds number, smooth-wall turbulent flows DALE PULLIN, California Institute of Technology, ANTHONY LEONARD, California Institute of Technology — This is an update of a hypothesis (Pullin, Inoue & Saito, Phys. Fluids, 2013) concerning the asymptotic state of some canonical, smooth-wall turbulent flows. There it was argued, based on the extrapolation to arbitrarily large Reynolds numbers ($Re_\tau$) of both the log-wake law for the mean velocity profile, and also of Townsend-Perry scaling for streamwise turbulent velocity fluctuations, that over almost all of the turbulent-flow layer, turbulent velocity fluctuations on outer scales asymptotically decline with increasing $Re_\tau$. Presently this is extended to include vorticity fluctuations using scaling proposed by Panton (Phys. Fluids, 2009). This suggests that, at least for turbulent channel flow, the asymptotic state consists of vanishingly-small turbulent velocity fluctuations but unbounded enstrophy ($\omega^2$) fluctuations on outer scales, over almost the whole turbulent-flow domain.

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Date submitted: 02 Aug 2013