Abstract Submitted
for the DFD05 Meeting of
The American Physical Society

Organization in Wall Turbulence RONALD ADRIAN, Arizona State Univ. — Important aspects of the complex and chaotic behavior of smooth- wall turbulence can be explained in terms of relatively simple (but as yet incomplete) physical model involving elementary vortices and their interaction to form groups of vortices and larger structures. This picture, involving hairpin vortices, quasi-streamwise vortices, packets of hairpins and, ultimately, very- large-scale structures, will be summarized and its implications regarding the mechanisms responsible for creation of Reynolds shear stress and growth of length scale will be discussed. The packets consist of hairpin-like eddies, and there is evidence that they are formed by a process of eddy polymerization in which eddies successively auto-generate more eddies in a chain. If the eddies in the packets are close enough, their coherent interaction creates additional Reynolds stress in a manner much like the intensification of magnetic flux by the windings in a solenoid. The very-large-scale motions are responsible for up to half of the total shear stress outside of the viscous buffer layer, and they may be the end- result of a process involving multiple mergers of ever larger packets.

Ronald Adrian
Arizona State Univ.

Date submitted: 14 Aug 2005 Electronic form version 1.4