Meeting: 1000, Albuquerque, New Mexico, SS 9A, Special Session on Mathematical Methods in Turbulence

1000-76-204 **Peter Vorobieff*** (kalmoth@unm.edu), Dept. of Mechanical Engineering, Albuquerque, NM 87131. *Shock-driven transition to turbulence: curiouser and curiouser.*

Impulsive (e.g., shock) acceleration of a density interface producing misalignment between pressure and density gradients leads to vortex roll-up. This impulsively-driven Richtmyer-Meshkov instability (RMI) is similar in some aspects to the gravity-driven Rayleigh-Taylor instability. The deterministic nonlinear evolution of the RMI-induced large-scale vortices triggers secondary instabilities, driven by shear, again by density-pressure gradient misalignment, or by 3D effects. These instabilities add disordered components to the flow. As the disordered small-scale structures become more prominent, the flow transitions to turbulence. A study of RMI evolving from a very simple initial geometry yields new insights into the general problem of turbulent transition . A planar shock accelerates a cylindrical heavy gas column immersed in lighter gas. In experiments with reliably reproducible initial conditions, the velocity and concentration fields are resolved. Ensemble averaging reveals the large-scale deterministic flow structure, facilitating decomposition of the flow into deterministic and disordered components and quantification of the energy transfer from the former to the latter, thus elucidating the formation of the energy cascade commonly associated with turbulence. (Received August 24, 2004)