Abstract Submitted
for the DFD06 Meeting of
The American Physical Society

Content of a Graduate Course in Fluid Mechanics RONALD PANTON, University of Texas — This talk will give some of my personal choices for educating specialists in fluid flow. The first course should emphasize physics and leave CFD, turbulence, microflows, surface tension flows, and other specialties to separate courses. General topics that should be covered include: concepts and definitions; physical and viscous laws; control volume laws; local laws; elemental flow situations; dimensional analysis, and the characteristics of different flow categories (Stokes flow, lubrication theory, ideal flow, boundary layers, etc.). At the graduate level, more precision and rigor is desired. Exact solutions are valuable as examples of physical events and as illustrations of trends for concepts and properties. The availability of Excel, Mathcad, or Matlab allows students to investigate and visualize flow properties and their trends with parameters. Dimensional analysis should not end with correlations and similarity, but also emphasize variable scaling, variable references, and proper forms for limiting parameters to extreme values. Graduate students need to view flow categories as parameter limits for certain boundary conditions. Asymptotic expansions are a formal mathematical structure for flow categories. I use the Jeffrey-Hammel wedge flow as an exact solution that demonstrates the various categories of incompressible flows for all Reynolds number limits. An integrated knowledge of physics is an advanced viewpoint that extends specific knowledge of a series of flow patterns.

Ronald Panton
U Texas

Date submitted: 04 Aug 2006 Electronic form version 1.4