5005-A1-53   **David Donoho***, Stanford University. *Sparsity and High Dimensional Geometry.*
I'll begin with some examples showing there are important connections between these topics. An example is the relationship between neighborliness of polytopes and the solution of ell_0 minimization problems by l_1 minimization. Next I'll discuss the phenomenon of phase diagrams and empirically observable phase transitions in geometric properties; such transitions become very sharp and precisely located as the dimension increases. I'll give a half dozen or so examples of such transitions, some of which already have rigorous explanations; others do not. These transitions correspond to important algorithmic and inferential phenomena, such as sampling theorems, sublinear complexity of algorithms, breakdown of robust estimation methods. Much of this is joint with co-authors, including Jared Tanner, Yaki Tsaig and Iain Johnstone. (Received July 03, 2007)