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**Thomas Y. Hou\*** ([hou@acm.caltech.edu](mailto:hou@acm.caltech.edu)), Applied and Comput. Math, 217-50, Caltech, Pasadena, CA 91125. *Recent Progress on Dynamic Stability and Global Regularity of 3D Incompressible Euler and Navier-Stokes Equations.*

Whether the 3D incompressible Euler and Navier-Stokes equations can develop a finite time singularity from smooth initial data with finite energy has been one of the most long standing open questions. We review some recent theoretical and computational studies which show that there is a subtle dynamic depletion of nonlinear vortex stretching due to local geometric regularity of vortex filaments. Our studies also reveal a surprising stabilizing effect of convection for the 3D incompressible Euler and Navier-Stokes equations. Finally, we prove nonlinear stability and the global regularity of a class of solutions which exhibit interesting dynamic growth. (Received September 05, 2009)