1030-76-293 **Zhiwu Lin*** (lin@math.missouri.edu), Department of Mathematics, University of Missouri-Columbia, Columbia, MO 65203. *Instability of surface water waves.* Preliminary report.

The 2-D pure gravity water waves are described by the Euler equations with free boundary conditions on the top surface. There exist traveling periodic and solitary waves, as commonly observed in nature. Their stability has been studied a lot by the approximate models like KDV. We give some recent results on stability of the full water wave problem. First, with Vera Hur, we consider the bifurcation and stability of small amplitude periodic waves in a running water with a background shear flow. The results include: the free surface has a destabilizing effect for shear flow stability; there exist a bifurcation of nontrivial waves of any period for general background flows, which is not due to the exchange of stability of trivial solutions; moreover, the small irrotational waves is structurally unstable. More specifically, it is shown that there exists unstable small periodic waves with arbitrarily small vorticity in a water of any depth, although the small irrotational waves are known to be stable under perturbations of the same period. We will also describe some recent progress on instability of large amplitude water waves, which is related to wave breaking. (Received August 07, 2007)