998-76-61 **Roland Glowinski** (roland@math.uh.edu), 4800 Calhoun Rd, room PGH 651, Houston, TX 77004, and **Hector Juarez*** (hect@xanum.uam.mx), Av. San Rafael Atlixco 186, Col. Vicentina, Iztapalapa, 09340 Mexico, DF, Mexico. *Finite Element Method and Operator Splitting for a Viscous Incompressible Free Surface Flow.*

In this talk we discuss the numerical solution of a time-dependent two-dimensional viscous flow with a free capillary surface by a methodology combining a finite element approximation, time discretization by operator-splitting, and a Taylor-Galerkin scheme for the relocation of the free boundary. We take advantage of operator splitting methods, to avoid iterative procedures for locating the free boundary; generally these procedures are quite costly for practical calculations. A stable isoparametric finite element approximation of low order is used to handle the geometry of the curved domain. The resulting discrete equations have the same structure as in the fixed fixed boundary case, so that we can extend existing Navier–Stokes solvers to the solution of these new problems. In addition, the global variational formulation is modified to decouple the two velocity components from the deformation tensor, obtaining a significant simplification from the computational point of view. The results of two numerical experiments will be presented. (Received January 17, 2004)