Meeting: 1001, Evanston, Illinois, SS 11A, Special Session on Stability Issues in Fluid Dynamics

1001-76-245 **Mary Silber*** (m-silber@northwestern.edu), Dept. of Engineering Sciences, and Applied Mathematics, Evanston, IL 60208, and **Jeff Porter** and **Chad M. Topaz**. *Faraday wave pattern selection via multi-frequency forcing.*

Standing waves form on the free-surface of a fluid when it is subjected to a time-periodic vertical acceleration of sufficient strength. These so-called Faraday waves result from a symmetry-breaking parametric instability. The wave patterns exhibit a rich variety of spatial forms in laboratory experiments; the nature of the spatio-temporal patterns depends on the frequency content of the forcing function. We consider the weakly-damped, weakly-forced limit of this problem and use methods of equivariant bifurcation theory to investigate how weakly nonlinear three-wave interactions are enhanced or suppressed by the various Fourier components of a time-periodic parametric forcing function. Our analysis takes into account spatio-temporal symmetries as well as weakly-broken time-reversal and Hamiltonian symmetries. Our results suggest how to control the Faraday wave pattern selection process by judicious choice of the frequency content of the forcing function. We explore the validity of our asymptotic results by direct numerical computation of coefficients in amplitude equations governing three-wave interactions from a PDE model of the Faraday wave problem applicable in the case of nearly-inviscid, deep fluid layers. Our results shed light on recent Faraday wave laboratory experiments. (Received August 27, 2004)