

Abstract Submitted  
for the DFD11 Meeting of  
The American Physical Society

**Creating sharp features by colliding shocks on ion bombarded surfaces** MIRANDA HOLMES-CERFON, MICHAEL BRENNER, Harvard University — When a surface is bombarded with ions, it erodes at different rates depending on the slope of the surface, and intricate patterns can evolve. On large scales the surface slope evolves according to a conservation law, which can form shocks, while the type of shocks which can occur are governed by the small-scale fourth-order surface diffusion. As in thin film flows, undercompressive shocks (which violate the Lax entropy condition) can occur, and appear to dominate the dynamics when the initial surface contains slopes which are large enough. We show that when two undercompressive shocks moving in opposite directions collide, they form a shock which is undercompressive from both sides. In the height variable this is a stationary, knife-edge like ridge with steep sides; interestingly the slopes are much larger than any contained in the initial surface patterning. This suggests a possible method to pattern surfaces on the small scale more cheaply than by conventional methods: by patterning the surface initially on the macroscale to have slopes of  $O(1)$ , and then bombarding it with ions, the surface may spontaneously develop features which are much smaller and steeper.

Miranda Holmes-Cerfon  
Harvard University

Date submitted: 05 Aug 2011

Electronic form version 1.4