Abstract Submitted
for the MAR17 Meeting of
The American Physical Society

An elastic dimpling instability with Kosterlitz-Thouless character and a precursor role in creasing TYLER ENGSTROM, JOSEPH PAULSEN, JENNIFER SCHWARZ, Syracuse University — Creasing instability, also known as sulcification, occurs in a variety of quasi-2d elastic systems subject to compressive plane strain, and has been proposed as a mechanism of brain folding. While the dynamics of pre-existing creases can be understood in terms of crack propagation, a detailed critical phenomena picture of the instability is lacking. We show that surface *dimpling* is an equilibrium phase transition, and can be described in a language of quasi-particle excitations conceptualized as "ghost fibers" within the shear lag model. Tension-compression pairs (dipoles) of ghost fibers are energetically favorable at low strains, and the pairs unbind at a critical compressive plane strain, analogously to vortices in the Kosterlitz-Thouless transition. This dimpling transition bears strong resemblance to the creasing instability. We argue that zero-length creases are ghost fibers, which are a special case of "ghost slabs". Critical strain of a ghost slab increases linearly with its length, and is independent of both shear modulus and system thickness.

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Date submitted: 11 Nov 2016 Electronic form version 1.4