Abstract Submitted
for the MAR16 Meeting of
The American Physical Society

Ripplocations: A Novel Defect in Layered Materials JACOB GRUBER, ANDREW LANG, JUSTIN GRIGGS, GARRITT TUCKER, MICHEL BARSOUM, Drexel Univ — Recently, a new defect, the ripplocation, the mechanical buckling of a single atomic layer, was proposed to explain the behavior of two dimensional materials. Leveraging atomistic simulations, this concept is extended to bulk layered materials. Unlike dislocations, ripplocations do not possess a Burgers vector and do not have polarity. In graphite, ripplocations are attracted both to vacancies, where they can annihilate, and other ripplocations, forming larger complexes and eventually kink boundaries. While some ripplocation behavior can be described by dislocation complexes, the failure of these models to explain core interactions suggests that ripplocations are a fundamentally new class of defect. Furthermore, TEM examination of nanoindented Ti_3SiC_2, where dislocation theory does not provide a complete description of behavior, reveals the presence of defects with no Burgers vector and with rotation and strain fields similar to those predicted in simulation, suggesting the presences of buckled basal planes. Ripplocations have profound implications for the deformation of plastically anisotropic solids, including graphite, layered silicates and the MAX phases.

Jacob Gruber
Drexel Univ

Date submitted: 06 Nov 2015 Electronic form version 1.4