Abstract Submitted
for the MAR14 Meeting of
The American Physical Society

Kinetics and Mechanics of Asymmetric Closure in the Venus Flytrap's Fast Motion ZI CHEN, STEPHEN XIE, Washington University — In this work, we aimed to investigate the biomechanical mechanisms behind rapid movements in plants by studying the Venus flytrap (Dionaea Muscipula) and some of the peculiar features of its unique snapping mechanism. After two consecutive stimulations of the interior trigger hairs, equilibrium within each leaf lobe is upset and each transitions from a stable convex state to a stable concave state. While one could assume the motions of two leaves to be symmetric, they are not in a lot of cases. When stimulation of trigger hairs occurs unilaterally, for example, the stimulated leaf lobe sometimes closes more rapidly than the other leaf lobe. We recorded multiple closures on a number of traps with varied stimuli locations with a high speed camera to explore the roles of intrinsic and extrinsic factors that drive this asymmetric trap closure. Three material points were tracked over time for each closure, allowing calculation of the angular speed and acceleration of the distal edge of each lobe. Analysis of the angle differences between lobes and the location of stimuli clarified how extrinsic, unilateral stimuli drive asymmetric closure. It can be argued that there could also be some biological advantages in capturing moving preys through this asymmetric motion. Ultimately, the principles derived from studying the Venus flytrap may inspire designs for bio-mimetic devices leading to a range of engineering applications.

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Date submitted: 15 Nov 2013 Electronic form version 1.4