1124-35-81 **John Gemmer*** (gemmerj@wfu.edu), Department of Mathematics and Statistics, Wake Forest University, 127 Manchester Hall, Winston Salem, NC 27109, and **Shankar Venkataramani**, **Toby Shearman** and **Eran Sharon**. *Isometric Immersions, Energy Minimization and Branch Points in Non-Euclidean Elastic Sheets.*

The edges of torn elastic sheets and growing leaves often display hierarchical self-similar like buckling patterns. On the one hand, such complex, self similar patterns are usually associated with a competition between two distinct energy scales, e.g. elastic sheets with boundary conditions that preclude the possibility of relieving in plane strains, or at alloy-alloy interfaces between distinct crystal structures. On the other hand, within the non-Euclidean plate theory this complex morphology can be understood as low bending energy isometric immersions of hyperbolic Riemannian metrics. In this talk we will show that this complex morphology (i) arises from isometric immersions (ii) is driven by a competition between the two principal curvatures, rather than between bending and stretching. We identify the key role of branch-point (or monkey-saddle) singularities, in complex wrinkling patterns within the class of finite bending energy isometric immersions. Using these defects we will give an explicit construction of strain-free embeddings of hyperbolic surfaces that are fractal like and have lower elastic energy than their smooth counterparts. (Received August 29, 2016)