1146-49-381 **John Gemmer*** (gemmerj@wfu.edu), Department of Mathematics, Wake Forest University, 127 Manchester Hall, Winston-Salem, NC 27109, and **Maximilian Rezek**, Department of Mathematics, Wake Forest University, 127 Manchester Hall, Winston Salem, NC 27109. *Isometric immersions and self-similar buckling in non-Euclidean elastic sheets.* Preliminary report.

The edges of torn elastic sheets and growing leaves often display hierarchical self-similar like buckling patterns. This complex morphology can be understood as low bending energy isometric immersions of hyperbolic Riemannian metrics. With this motivation we study the isometric immersion problem in a strip with an asymptotically decaying metric. By finding explicit piecewise smooth solutions of hyperbolic Monge-Ampere equations, we show there exist periodic isometric immersions of hyperbolic surfaces in the small slope regime. We extend these solutions to exact isometric immersions through resummation of a formal asymptotic expansion. Using this construction, 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 give an explicit construction of strain-free embeddings of hyperbolic surfaces that are fractal like and have lower elastic energy than their smooth counterparts. Further, our results identify the key role of the degree regularity of the isometric immersion in determining the global structure of a non-Euclidean elastic sheet in 3-space. (Received January 27, 2019)