1145-74-2983 **Charles L Talbot*** (ctalbot@live.unc.edu), University of North Carolina at Chapel Hill, Phillips Hall, Department of Mathematics, Chapel Hill, North Carolina 27514, Chapel Hill, NC 27514. *A Hybrid Finite Element Method for Nonlocal Models of Mechanics and Failure of Biological Tissue.*

Nonlocal models and associated hypersingular integral operators have been widely adopted in disciplines ranging from machine learning (nonlocal neural networks) to fracture mechanics (Peridynamics), and continue to inspire work in pure and applied mathematics. In particular, myriad integral reformulations of classical Continuum Mechanics have been developed for representing physics of material failure at multiple scales, predominantly in the context of brittle materials characterized by rapid catastrophic propagation and branching of discontinuities. We expand on the recent notion of the asymptotic local compatibility of nonlocal numerical schemes, with an emphasis on conditions in the context of hybrid mesh-free methods and the Finite Element Method. We emphasize the Discontinuous Galerkin finite element method and fluid-structure interaction in the context of Biological soft tissues, and construct a hybrid Nonlocal Finite Element method that reduces to a Discontinuous Galerkin method in the local limit, and is amenable to multiscale descriptions of discontinuous vector fields. We extend this to a novel scheme that incorporates adaptivity through the nonlocal length scale, and demonstrate how the scheme consistently recovers, across a range of nonlocal parameters, classical results from common benchmark tests in the context of nonlinear elasticity. Finally, we apply the Nonlocal Finite Element Method to a case of rupture in a biological tissue described by the Holzapfel-Gasser-Ogen material model with experimental data. (Received September 26, 2018)