1067-74-1909 **Michael Stuebner*** (mstuebn@ncsu.edu), NCSU, Department of Mathematics, Box 8205, Raleigh, NC 27695, and **Robert P Lipton** (lipton@math.lsu.edu), LSU, Department of Mathematics, Lockett Hall, Baton Rouge, LA 70803. *Modeling damage evolution in high strength titanium alloys.*

In this talk we present a new multi-scale model for linking higher order micro-structure descriptions to failure initiation and crack propagation in high strength titanium alloys. The model gives an accurate local field description for predicting damage nucleation at the length scale of the polycrystalline texture. Current methods focus on average properties inside textured polycrystals and the overall effective response of structures due to macroscopic loading and are unable to capture local effects leading to damage nucleation and damage propagation. The new method allows the recovery of the explicit geometry of the damage micro structure inside the domains of microtexture and can capture the conditions for fatigue failure through propagation of a macro crack. Computational examples for damage evolutions for different load cases demonstrate the potential of our model. (Received September 22, 2010)