1056-74-2101 **David L Chopp*** (chopp@northwestern.edu), ESAM, Tech Institute, Northwestern University, 2145 Sheridan Rd., Evanston, IL 60208. *Simulation and validation of 3-dimensional fatigue cracks.*

In this talk we will describe a novel algorithm developed in collaboration with Global Engineering and Materials, Inc. to simulate fatigue cracks. The algorithm uses a combination of the eXtended Finite Element Method (X-FEM) and the Fast Marching Method (FMM) to compute the evolution of a two-dimensional crack surface inside an irregular 3-dimensional object. The simulations are run using geometries from actual airplane parts and comparisons are made between physical stress experiments and numerical simulations demonstrating the effectiveness of both the mathematical model and the numerical implementation to reliably assess risk of failure of stressed solid materials. (Received September 23, 2009)