"Distribution Effects in Damage Mechanics."

Key issues pertaining to the development of viable damage evolution equations using a continuum damage mechanics (CDM) approach with internal state variables (ISV's) are addressed. While low-order ISV representations of damage (void volume fraction, crack density tensor, etc.) have sufficed to characterize the effective moduli of bodies with distributed voids or cracks, addressing the growth of distributed defects demands a more comprehensive description of the details of defect configuration and size distribution. Statistical inhomogeneity of evolution may arise when damage interactions become significant or when use of certain low-order damage variables leads to response functions related to evolution that have an intrinsic flaw size dependence. Moreover, interaction of defects over multiple length scales necessitates a methodology to sort out the change of internal structure associated with these scales.

An argument for implementing ISV's based upon the damage distribution within the RVE used for stiffness determination is presented. The mean mesoscale gradient is introduced as an ISV in order to reflect systematic differences in the sub-RVE size and spatial distributions of damage entities in the evolution process. Based on a series of finite element calculations involving evolution of 2-D cracks in brittle solids, the evolution of the mean mesoscale gradients is examined and some preliminary implications for the utility of such an approach are noted. Use of higher-order ISV's based on the higher-order moments of the sub-RVE damage distribution may provide a framework for extending CDM to the statistically inhomogeneous case involving interactive damage.

Friday, October 30, 1998
3:00 PM in 335 Jabara Hall

Please join us for refreshments before the lecture
at 2:30 p.m. in room 353 Jabara Hall.