

The Department of Mechanical Engineering presents:

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Professor

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University of California, Irvine

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11:10AM-12:00PM

Winston Chung Hall 205/206



## Quantitative Percussion Diagnostics for Nondestructive Determination of Structural Integrity

### **Abstract:**

A novel mechanical test methodology has been developed that provides diagnostic information for determining the mechanical integrity of biological and man-made materials and structures. This technology is based on nondestructive percussion loading and can be used to identify both global and localized weaknesses in a structure. For example, the data can be used to assess both overall dynamic modulus and whether defects such as cracks are present. Dynamic finite element models of percussion diagnostics on laminar composites and the natural tooth complex were performed. Model results for intact specimens as well as those containing a simulated fatigue crack have been generated that agree well with the experimental data. These model results demonstrate how the presence of a crack can significantly alter the percussion response that is measured while the probe is still in contact with the specimen.

**Biography:** James Earthman has been a faculty member at the University of California, Irvine since July 1988. He received his B.S. degree (1980) in Materials Science from Rice University and his M.S. (1982) and Ph.D. (1986) degrees in Materials Science and Engineering from Stanford University. Prof. Earthman's research activities include studies of a broad range of deformation and damage mechanisms in both model and advanced materials. His work has also involved the studies of the corrosion behavior of metals exposed to biologically derived agents and novel nondestructive diagnostic methodologies. He has authored and co-authored over 100 research publications including two chapters on tissue engineering. He is editor for two books in the fields of Materials Science and Biomedical Engineering and is a member of the editorial board for Metallurgical and Materials Transactions A. He is an inventor on six issued US patents, two international patents, and two pending US patents; and co-founder of Perimetrics LLC, a diagnostic device company in Newport Beach, CA.

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