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Spring 2008 Seminar

**MECHANICS RESEARCH COMMUNICATIONS**

# Elsevier Distinguished Lecture

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**Elsevier and the NJIT Granular Science Laboratory**

**Prof. Jan Achenbach**

***Northwestern University***

Departments of Civil Engineering, Mechanical Engineering and Applied Mathematics  
Evanston, IL 60208

**April 14, 2008**

**11:30 a.m. – 1:00 p.m.**

**Guttenberg Information Technologies Center (GITC) Rm. 3730 & 3740 GITC**

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## Structural Health Monitoring – What is the Prescription?

Structural Health Monitoring (SHM) systems can prevent structural failure of safety-critical structures such as aircraft, bridges, nuclear reactors and dams, which cannot be allowed to fail. An SHM system provides continuous (or on-demand) information about the state of a structure so that an assessment of the structural integrity can be made at any time, and timely remedial actions may be taken as necessary. A large number of sensors forms the front end of an SHM system to provide information on the condition of the structure. As will be discussed, the information from the sensors is incorporated into structural analyses and failure models to assess the state of the structure and to predict the remaining lifetime. Thus, the underlying concept is based on detecting and characterizing damage and assessing it in terms of failure mechanics and damage growth laws. Materials engineering and applied mechanics play dominant roles in both the diagnostic and prognostic components of SHM. A probabilistic approach is essential, as will be shown by an example of pre-crack fatigue damage and the growth and detection, or lack thereof, of subsequent surface-breaking cracks.

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Dr. Jan Achenbach was born in the Netherlands, and studied aeronautical engineering at the Technical University of Delft. He came to the United States in 1959, and was awarded the Ph.D. Degree by Stanford University in 1962. After a post-doctoral year at Columbia University, he joined the faculty of Northwestern in 1963. He is now Walter P. Murphy and Distinguished McCormick School Professor in the departments of Civil and Mechanical Engineering.

Dr. Achenbach's recent research has been concerned with quantitative non-destructive evaluation and structural health monitoring. He has made contributions in the field of propagation of mechanical disturbances in solids, particularly ultrasonics. He has developed methods for flaw detection and characterization by ultrasonic scattering methods.

Dr. Achenbach is the founder of Northwestern's Center for Quality Engineering and Failure Prevention, a state-of-art laboratory for quality control in structural mechanics. He was awarded the 2003 National Medal of Technology, and the 2005 National Medal of Science. He was elected a member of the National Academy of Engineering in 1982, a member of the National Academy of Sciences in 1992 and a Fellow of the American Academy of Arts and Sciences in 1994. In 1999 he was elected a Corresponding Member of the Royal Dutch Academy of Sciences. He is also an honorary member of the American Society of Mechanical Engineers and a Fellow of ASME, ASA, SES, AAM and AAAS. His awards include the Timoshenko Medal and the William Prager Medal.

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