



THE UNIVERSITY OF ARIZONA

College of Engineering

The Department of Aerospace and Mechanical Engineering  
William R. Sears Memorial Lecture Series

**Thursday, Nov. 8, 2018 at 4:00 pm**  
**AME Lecture Hall, Room S212**



**Dr. Dewey H. Hodges**

Professor, The Daniel Guggenheim School of Aerospace Engineering  
Georgia Institute of Technology, Atlanta, Georgia

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## **Unified Approach for Accurate and Efficient Modeling of Composite Beams, Plates, and Shells**

**Abstract:** Development of a unified approach, which spans several decades and facilitates accurate and efficient modeling of composite helicopter rotor blades for loads, dynamics, aeroelasticity, and stress recovery, is described. The approach achieves accuracy comparable to that of three-dimensional finite element analysis but with significant savings in computational effort. The basis for this approach is a mathematical technique called the variational asymptotic method, as presented by Berdichevsky in the 1970s and 1980s. This presentation summarizes the modeling approach and presents some of the key equations of the resulting analyses. Examples are presented that illustrate the accuracy and efficiency of the approach as implemented in the computer application Variational Asymptotic Beam Section (VABS) and appropriate beam equations. Brief description of a similar tool for plates and shells, called VAPAS, is also included. Finally, results obtained from a generalization of the modeling approach are presented termed “structure genome.”

**Bio:** Dr. Dewey H. Hodges became Professor of Aerospace Engineering at Georgia Tech in 1986. From 1970-1986 he was a research scientist at the U.S. Army Aeroflightdynamics Directorate located at Ames Research Center. During those years he also served as a Lecturer at Stanford University and in 1984 was a guest research scientist at the DLR in Braunschweig, Germany. Dr. Hodges has published five books and over 380 technical papers in journals and conference proceedings in the fields of rotorcraft dynamics, structural dynamics, aeroelasticity, structural mechanics and stability, computational mechanics, and optimal control. He has advised 34 PhD graduates and 39 MS graduate in his 32 years at Georgia Tech. Dr. Hodges is an elected Fellow of the American Institute of Aeronautics and Astronautics, the American Society of Mechanical Engineers, the American Helicopter Society, and the American Academy of Mechanics. Dr. Hodges serves on the editorial boards for the *Journal of Fluids and Structures*, the *Journal of Mechanics of Materials and Structures*, and *Nonlinear Dynamics*. He has served on the AHS Dynamics Committee and the AIAA Structural Dynamics Technical Committee, served as chairman of the Stability Committee of the ASCE Engineering Mechanics Division, as an Associate Editor of the *AIAA Journal*, *Vertica: the International Journal of Rotorcraft and Powerlift Aircraft*, and the *ASCE Journal of Engineering Mechanics*. Dr. Hodges is also on the Editorial Boards of the *International Journal of Solids and Structures* and the *International Journal for Engineering Analysis and Design*. You can view his webpage at: <http://www.dhodges.gatech.edu/>

**Light Reception immediately following lecture in the AME East Courtyard**