

JAN DREWES ACHENBACH

Walter P. Murphy Professor

Distinguished McCormick School Professor

Emeritus-in Service

Departments of Civil and Environmental Engineering , Mechanical Engineering ,
and Engineering Science and Applied Mathematics
McCormick School of Engineering and Applied Science
Northwestern University

EDUCATION

1953-1959 Technische Hogeschool, Delft, aeronautical engineering
1959-1962 Stanford University Major: aeronautics and astronautics
Minor: mathematics

DEGREES

PH.D. 1962 Stanford University

ACADEMIC CAREER

1962-1963 Preceptor, Columbia University
1963-1966 Assistant Professor of Civil Engineering
Northwestern University
1966-1969 Associate Professor of Civil Engineering
Northwestern University
April 1969 - Visiting Associate Professor
June 1969 University of California, La Jolla
September 1969- Professor of Civil Engineering
March 1981 Northwestern University
September 1970- Visiting Professor,
April 1971 Technische Hogeschool, Delft
March 1981 - Walter P. Murphy Professor, Departments of Civil and
Environmental Engineering, Mechanical Engineering, and
Engineering Science and Applied Mathematics
September 1985 - Director, Center for Quality Engineering
2006 and Failure Prevention, Northwestern University
September 1992 - Distinguished McCormick School Professor, Northwestern
University

OTHER ACADEMIC APPOINTMENTS

September 1981 - Consulting Professor, Huazhong Institute of Science and
Technology, Wuhan, Hubei, Peoples Republic of China

MAJOR AWARDS

2005 U.S. National Medal of Science
2003 U.S. National Medal of Technology
Member National Academy of Sciences, 1992
Member National Academy of Engineering, 1982
Fellow American Academy of Arts and Sciences, 1994
Corresponding Member Royal Dutch Academy of Arts and Sciences, 1999

Honorary Foreign Member, National Academy of Sciences, Republic of Korea, 2010
Foreign Member Academia Europaea, 2010
Honorary Member, American Society of Mechanical Engineers, 2002
Timoshenko Medal, American Society of Mechanical Engineers, 1992
William Prager Medal, Society of Engineering Science, 2001
Raymond D. Mindlin Medal, American Society of Civil Engineers, 2009
Theodore von Karman Medal, American Society of Civil Engineers, 2010
McDonnell-Douglas Model of Excellence Award, 1996
American Academy of Mechanics Distinguished Service Award, 1997
ASEE Curtis W. McGraw Research Award, ASEE, 1975
Fellow Society of Engineering Science, 2002
Fellow American Association for the Advancement of Science, 1998
Fellow Acoustical Society of America, 1998
Fellow American Society of Mechanical Engineers, 1979
Fellow American Academy of Mechanics, 1973
Fellow Japan Society for the Promotion of Science, 1988
Outstanding Paper Award, Materials Evaluation (American Society for Nondestructive Testing), 2002
ICES Medal, International Conference on Computational & Experimental Engineering and Sciences, 2003
Tutorial Citation Award, American Society for Nondestructive Testing, 2004
SPIE-NDE Lifetime Achievement Award, 2005
Best Paper Award, SPIE's International Symposium on NDE, 2006
Member at Large of the General Assembly of the International Union of Theoretical and Applied Mechanics (IUTAM), 2008
Fellow World Class Universities Program, National Research Foundation of Korea, 2009

EDITORSHIPS

Member Editorial Board, Proceedings National Academy of Sciences, 2003-2005
Contributing Editor: Mechanics of Composite Materials and Structures, 1994-1998
Editorial Board: Research in Nondestructive Evaluation, 1989-present
Editorial Board: Journal of Nondestructive Evaluation, 1989-present
Member International Advisory Editorial Board: Acta Mechanica Sinica, 1988-1998
Member Board of Editors: North Holland Series in Applied Mathematics and Mechanics, 1982 – 2007.
Associate Editor, Journal of Applied Mechanics, 1982-1983
Chairman Editorial Committee: 50th Anniversary Issue, Journal of Applied Mechanics, 1982-1983
General Editor: Mechanics and Mathematical Methods-Series of Handbooks, North-Holland Publishing Co., 1980-2006.
Editor-in-Chief, WAVE MOTION, an International Journal Reporting Research on Wave Phenomena, 1979-present
Member Editorial Board, Journal of Thermal Stresses, 1978-2003
Member Board of Editors, International Journal of Solids and Structures, 1971-1996

Associate Editor, Journal of Applied Mechanics, 1971-1976
Member Editorial Advisory Board of ELASTICITY, 1970-2007.
Acting Editor, International Journal of Solids and Structures, 1969-1970

MAJOR COMMITTEES

Chairman Symposium Selection Committee, International Union of Theoretical and Applied Mechanics, 2000-2008.
Committee on Membership, National Academy of Engineering, 1997-2000
International Advisory Committee of the 14th World Conference on Nondestructive Testing, 1996
Peer Committee for Mechanical Engineering, National Academy of Engineering, 1995-1997
Class III Membership Committee, National Academy of Sciences, 1994
Member National Materials Advisory Board, 1990-1998
Member-at-Large, American Association for the Advancement of Science, 1994-1998
NIST Review Panel for Manufacturing Engineering, 1992-1998
Review Committee for Nominations for Fellow of the ASME, 1988-1994
Chairman ASME Thurston Lecture Committee, 1987-1989
U.S. National Committee on Theoretical and Applied Mechanics, 1972-1978, 1986-present
Congress Committee, International Union of Theoretical and Applied Mechanics, 1986-1994
Executive Committee Applied Mechanics Division ASME, 1979-1985
President, American Academy of Mechanics, 1978-1979
President, Association of Chairmen of Departments of Mechanics, 1971-1973

SELECTED PUBLICATIONS:

BOOKS

Wave Propagation in Elastic Solids, North-Holland Publishing Company/American Elsevier, Amsterdam/New York, 1973.
A Theory of Elasticity with Microstructure for Directionally Reinforced Composites, CISM Monograph 167, Springer Verlag, Vienna/New York, 1975.
Ray Methods for Waves in Elastic Solids – with Applications to Scattering by Cracks, (with A. K. Gautesen and H. McMaken), Pitman Advanced Publishing Program, Boston/London/Melbourne, 1982.
Reciprocity in Elastodynamics, Cambridge University Press, Cambridge, UK, 2003.

SELECTED PAPERS

(with H. I. Epstein), “Dynamic Interaction of a Layer and a Half-Space,” *J. of the Engr. Mechs. Div. ASCE*, **93**, pp. 27-42, 1967.

(with C. T. Sun and G. Herrmann), "Continuum Theory for a Laminated Medium," *J. of Applied Mech.*, **35**, pp. 467-475, 1968.

"Dynamic Effects in Brittle Fracture," in *Mechanics Today*, **1**, ed. by S. Nemat-Nasser, Pergamon Press, Oxford, UK, pp. 1-57, 1974.

(with A. K. Gautesen), "Geometrical Theory of Diffraction for Three-D Elastodynamics," *J. Acoust. Soc. Am.*, **61**, pp. 413-421, 1977.

(with L. Adler, D. Kent Lewis and H. McMaken), "Diffraction of Ultrasonic Waves by Penny-Shaped Cracks in Metals: Theory and Experiment," *J. Acoust. Soc. Am.*, **66**, pp. 1848-1856, 1979.

(with Ch. Zhang), "A New Boundary Integral Equation Formulation for Elastodynamic and Elastostatic Crack Analysis," *J. of Appl. Mech.*, **111**, pp. 284-290, 1989.

(with H. Zhu), "Effect of Interfacial Zone on Mechanical Behavior and Failure of Fiber-Reinforced Composites," *J. Mech. Phys. Solids*, **37**, pp. 381-393, 1989.

(with J. Huang), "Dual-Probe Laser Interferometer," *J. Acoust. Soc. Am.*, **90**, pp. 1269-1274, 1991.

(with J. O. Kim) "Line-Focus Acoustic Microscopy to Measure Anisotropic Acoustic Properties of Thin Films," *Thin Films*, **214**, pp. 25-34, 1992.

(with J. Huang and S. Krishnaswamy), "Laser-Generation of Narrow-Band Surface Waves," *J. Acoust. Soc. Am.*, **92**, pp. 2527-2531, 1992.

(with I. N. Komsky, Y. C. Lee and Y. C. Angel), "Self-Calibrating Ultrasonic Technique for Crack Depth Measurement," *J. of Nondestr. Eval.*, **11**, pp. 103-108, 1992.

"Measurement Models for Quantitative Ultrasonics," *J. Sound and Vibration*, **159**, pp. 385-401, 1992.

(with I.N.Komsky), "A Modified Self-Compensating Ultrasonic Technique for Flaw Characterization in Steel Bridge Structures," "Review of Progress in Quantitative Nondestructive Evaluation, ed. by D.O.Thompson and D.E.Chimenti, Vol.13B, pp. 2107-2114, Plenum Press, 1994

(with C. Y. Wang), "Elastodynamic Fundamental Solutions for Anisotropic Solids," *Geophys. J. Int.*, **118**, pp. 384-392, 1994.

(with J. Kim and Y.-C. Lee), "Measuring Thin-Film Elastic Constants by Line-Focus Acoustic Microscopy," *Advances in Acoustic Microscopy*, ed. by Andrew Briggs, **1**, pp. 153-208, 1995.

(with I. N. Komsky, G. Andrew, B. Grills, J. Register, G. Linkert, G. Huerto, A. Steinberg, M. Asbaugh, D. Moore, and H. Weber), "An Ultrasonic Technique to Detect Corrosion in DC-9 Wing Box: From Concept to Field Application," *Materials Evaluation*, **52**, pp. 848-852, 1995.

(with Z. M. Connor, W. Li, and M. E. Fine), "Fatigue Crack Initiation and Growth in Riveted Specimens: An Optical and Acoustic Microscopic Study," *Int. J. Fatigue*, **19**, Supplement **1**, pp. S331-S338, 1997.

(with P. A. Fomitchov and S. Krishnaswamy), "Compact Phase-Shifted Sagnac Interferometer for Ultrasound Detection," *Optics & Laser Technology*, **29**, pp. 333-338, 1997.

(with A. K. Kromine, P. A. Fomitchov, and S. Krishnaswamy), "Laser Ultrasonic Detection of Surface-Breaking Discontinuities: Scanning Laser Source Technique," *Materials Evaluation*, **58**, pp. 173-177, 2000.

“Calculation of Surface Wave Motions Due to a Subsurface Point Force: An Application of Elastodynamic Reciprocity,” *J. Acoust. Soc. Am.*, **107**, pp. 1892-1897, 2000.

(with J. Aldrin, G. Andrew, C. Pan, B. Grills, R. T. Mullis, F. W. Spencer and M. Golis), “Case Study for the Implementation of an Automated Ultrasonic Technique to Detect Fatigue Cracks in Aircraft Weep Holes,” *Materials Evaluation*, **59**, pp. 1313-1319, 2001.

“Laser Excitation of Surface Wave Motion,” *J. Mech. Phys. Solids*, **51**, pp. 1885-1902, 2003.

“Simplifications for the calculation of surface wave pulses generated by laser irradiation,” *J. Acoust. Soc. Am.*, **116**, pp.1481-1487, 2004.

“The Thermoelasticity of Laser-Based Ultrasonics,” *J. of Thermal Stresses*, **28**, pp. 713-728, 2005.

“Combination of a Virtual Wave and the Reciprocity Theorem to Analyze Surface Wave Generation on a Transversely Isotropic Solid,” *Philosophical Magazine*, **85**, pp. 4143-4157, 2005.

“Reciprocity and Related Topics in Elastodynamics,” *Applied Mechanics Reviews*, **59**, pp. 13-32, 2006.

(with S.S. Kulkarni, L. Sun, B. Moran and S. Krishnaswamy) “A Probabilistic Method to Predict Fatigue Crack Initiation,” *Int. J. of Fracture*, **137**, pp. 9-17, 2006.

(with L. Sun, S. Kulkarni and S. Krishnaswamy), “Technique to Minimize Couplant-Effect in Acoustic Nonlinearity Measurements,” *The Journal of the Acoustical Society of America*, **120**, pp. 2500-2505, 2006.

“Application of the Reciprocity Theorem to Analyze Ultrasound Generated by High-Intensity Surface Heating of Elastic Bodies,” *Journal of Thermal Stresses*, **30**, pp. 841-853, 2007.

(with G. Petculescu), “Schedule Based NDT and Structural Health Monitoring of Safety Critical Composite Structures,” *Materials Evaluation*, **65**, pp. 731-739, 2007.

(with G.Petculescu and S. Krishnaswamy), “Group delay measurements using modally selective Lamb wave transducers for detection and sizing of delaminations in composites”, *Smart Materials and Structures*, **17**, pp.1-9, 2007.

(with S.S. Kulkarni), “Optimization of inspection schedule for a surface-breaking crack subject to fatigue loading,” *Probabilistic Engineering Mechanics*, **22**, pp. 301-312, 2007.

(with S.S. Kulkarni), “Structural Health Monitoring and Damage Prognosis in Fatigue,” *Structural Health Monitoring*, **7**, pp. 37-49, 2008.

(with M.Cohen and S.S.Kulkarni), Probabilistic Considerations are Essential to QNDE and SHM, *Structural Health Monitoring*, ed. by Fu-Kuo Chang, Vol. 1 pp.481-488, DEStech Publications, Inc, 2009.