Robert Hickling is president of Sonometrics Inc located in Huntington Woods, Michigan.

After obtaining an MA in pure and applied mathematics at the University of St. Andrews in Scotland, he worked as a Scientific Officer in the Royal Naval Scientific Service at Teddington, England on propeller theory [RH: "Propellers in the Wake of an Axisymmetric Body," **Trans. Inst. of Naval Architects, 99, Oct. (1957)**]. He subsequently transferred to the Underwater Detection Establishment in Portland where he worked on the classification of sonar targets [RH: "Frequency Dependence of Echoes from Bodies of Different Shape," **Journ. Acoust. Soc. Amer., 30, 2, (1958)**]. From there he attended the California Institute of Technology where he graduated with a PhD in engineering science, specializing in computer analysis of problems in underwater acoustic scattering and cavitation bubble collapse. He linked his calculations with experimental data, demonstrating for the first time that the elastic response of underwater targets determines the nature of sonar echoes [RH: "Analysis of Echoes for a Solid Elastic Sphere in Water," **Journ. Acoust. Soc. Amer, 34, (1962)**]. Numerical integration of Fourier transforms was used prior to the development of present standard algorithms. He also showed for the first time that the intensity of the luminescence from collapsing cavitation bubbles depends on the thermal conductivity of the gas dissolved in the liquid [RH: "Effects of Thermal Conduction in Sonoluminescence," **Journ. Acoust. Soc. Amer., 35, (1963**)]. In addition, for the first time he demonstrated how an outgoing shock wave is formed from the rebound of a collapsing cavitation bubble [RH and M. S. Plesset: "The Collapse and Rebound of a Spherical Bubble in Water," **Physics of Fluids, 7, 1, (1964)].**

He then went to the General Motors Research Laboratories in Warren, Michigan where he worked on a variety of problems, including (with permission from GM) underwater acoustic scattering [e. g. K. J. Diercks and RH: "Echoes from Hollow Aluminum Spheres in Water," **Journ. Acoust. Soc. Amer., 41, 2, Feb. (1967)**]. He also demonstrated theoretically that transient freezing is likely to occur in the liquid during the final stages of collapse of a cavitation bubble [RH: "Nucleation of Freezing by Cavity Collapse and its Relation to Cavitation Damage," **Nature**, 206, 4987, May (1965)]. He used computer-generated holograms in an experimental study of the scattering of light by liquid droplets [RH: "Holography of Liquid Droplets," **Journ. Opt. Soc. Amer.**, **59**, **10, Oct. (1969)**]. In addition, he calculated the contra-coup effect in the brain due to head impact [RH and M. L. Wenner: "Mathematical Model of a Head subjected to an Axisymmetric Impact," **Journ. of Biomechanics, Vol. 6, pp. 115-131, March (1973)**]. Additionally he performed experimental studies of ignition with a focused pulsed laser [RH and W. R. Smith:"Combustion Bomb Tests of Laser Ignition," **S.A.E. Transactions, Vol. 83, Section 1, Paper No.740114 (1974)**]. In 1971 he became leader of the noise-control research group working on noise sources in automobiles and on airbag noise, using recently–developed Fourier analyzers and experimental modal analysis.[e.g. I. D. Wilken and RH: "Measurement of Truck Tire Noise using a Single Wheel Trailer," **S.A.E. Symposium on Highway Tire Noise, Paper No. 762014, Nov 10-12, (1976):** RH: "The Noise of the Safety Air Cushion," **Noise Control Engineering, Vol. 6, No. 3, pp. 110-121, May-June (1976):** and RH, D. A. Feldmaier, F. H. K. Chen and J. S. Morel: "Cavity Resonances in Engine Combustion Chambers and Some Applications," **Journ. Acoust. Soc. Amer., Vol. 73, No. 4, April (1983)**]. In this latter paper the relation between cavity resonances and knock was investigated, and it was demonstrated

that cavity resonances can determine the bulk temperature and trapped mass in the cylinders of a diesel engine. Probably the most important discovery of the noise group (by J. Y. Chung) was the relation between sound intensity (i. e. sound power flow per unit area) and the imaginary part of the cross-spectrum of the pressures at two closely spaced microphones. This was applied in a number of ways [e. g. J. Pope, RH, D. A. Feldmaier and D. A. Blaser: "The Use of Acoustic Intensity Scans for Sound Power Measurement and for Noise Source Identification in Surface Transportation Vehicles," **S.A.E. Paper No. 810401, Feb., (1981)].** This work determines much of what RH did subsequently. In 1981 he organized a symposium on engine noise at GM and was the primary editor of the book of symposium papers [RH and M. M. Kamal (Editors) "**Engine Noise: Excitation, Vibration and Radiation", Plenum Press, (1982)**]. In 1983, interest in noise control at GM diminished and he began work on the use of ultrasound in manufacturing [RH and S. P. Marin: "The Use of Ultrasonics for Gauging and Proximity Sensing in Air," **Journ. of Acoust. Soc. Amer., Vol. 79, No. 4, (1986)** and V. Dahlmann and RH, "Focused Ultrasound to Inspect Locking Keys in Engine Valves", ***Sensors*, Journal of Machine Perception, 7, 27-38, (1990)].** Also he continued work on the use of electromagnetic radiation to stimulate combustion [RH, "Method and Means for Stimulating Combustion Especially of Lean Mixtures in Internal Combustion Engines" **US Patent, No. 4,556,020, Dec. (1985)**]

In late1988 he took early retirement from GM and went to work at the National Center for Physical Acoustics (NCPA) at the University of Mississippi where he became Associate Director for Applied Research and Research Professor of Engineering. There he continued to work on sound-intensity measurement [RH, "Narrow-Band Indoor Measurement of the Sound Power of a Complex Mechanical Noise Source", **Journ. Acoust. Soc. Amer., Vol. 87, (1990)**; W. Wei, RH and P. Lee, "Gated sound-power measurement using sound intensity," **J. Noise Control Eng., pp. 13-19, Aug. - Sept. (1992)** and RH and P. Lee, "Determining Sound Power in Reverberation Rooms and Other Indoor Work Spaces using Vector Sound-Intensity Measurement" **Proceedings NOISE-CON 97, 483-488, (June 1997**)]. Also he studied sound power flow in solids [RH, R. K. Burrows, J. F. Ball and M. Petrovic: "Power Flow for Sound Incident on a Solid Aluminum Sphere in Water," **Journ. Acoust. Soc. Amer. 89, 2509-2518 (1991)** and RH, "Visualization of Elastic Vibrations in Solid Structures," **Computing Systems in Engineering, 5, 27-40 (1994)].** He continued his interest in cavitation phenomena [RH, "Transient High-Pressure Solidification Associated with Cavitation in Water", **Phys. Rev. Letters, 73, 2853-2856 (1994)**]. He also developed an interest in insect acoustics, primarily to detect pests in agriculture [RH et al, "Multiple Acoustic Sensor System for Detecting Pink Bollworm in Bolls", **Proceedings of National Beltwide Cotton Conferences, San Diego, CA. Jan. (1994)** and. RH, W. Wei and D. W. Hagstrum, "Studies of Sound Transmission in Various Types of Stored Grain for Acoustic Detection of Insects", **Applied Acoustics, 50, 4, 263-278 (1997)**]. An interesting side-line was a study of acoustic communication by ants [RH and R. L. Brown, "Analysis of acoustic communication by ants," **Journ. Acoust. Soc. Amer., 108(4), 1920-1929 (2000)**, in which he developed the near-field theory of communication by ants and possibly by other insects.

In 1996, he retired from NCPA as Research Professor Emeritus of Engineering to provide consulting through his company Sonometrics Inc and to continue his involvement with sound-intensity measurement. He is active in the Society of Automotive Engineers in two areas: reducing the effect of airbag noise on hearing, and sound power measurement. He is particularly concerned with making acoustical practice more understandable and up-to-date [RH, "Decibels and octaves, who needs them?," **Journal of Sound and Vibration, 291/3-5, pp 1202-1207, (2006)**].

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