



## **Professor Ross M. Evan-Iwanowski (1914 – 2001)**

In Memory of Ross. M. Evan-Iwanowski (1914 – 2001), Published in *Nonlinear Dynamics*, Vol. 26, 2001, written by Subhash C. Sinha, Dept. of Mechanical Engineering, Auburn University, Alabama:

On March 18, 2001, the scientific community lost one of its pioneers in the field of nonlinear dynamics and vibrations. Professor Ross Evan-Iwanowski passed away in Orlando, Florida from complications following the surgery after his second stroke.

Dr. Evan-Iwanowski received his Master of Science degree in 1937 from Wilno University, Poland and a Ph.D., delayed by WWII, in 1954 from Cornell University. A year later he joined the engineering faculty of Syracuse University and started organizing the Applied Mechanics Laboratory (AML) for which he served as the research director.

Dr. Evan-Iwanowski initiated at AML an intensive study on stability of thin structural elements using nonlinear formulations, proposed then by Von Karman, and experimentation for static stability. Some new 'firsts' were posted: the significance of nonlinear effects and boundary fixation, careful preparation of the test models, experimental set-up and execution of the tests. Very good agreements were obtained between theory and experiments for spherical shells and caps subjected to concentrated symmetrical and asymmetrical forces and superimposed uniform loads; cylindrical monocoque and reinforced shells subjected to axial symmetrical and asymmetrical edge forces (the GE shells error) superimposed on the uniform external pressures (Stein-Fischer controversy). The error in the 'GE-shell' calculation had been definitely removed, and the Stein-Fischer

controversy was resolved analytically by Koiter and experimentally confirmed at AML. This pioneering work not only supplied design criteria, but more importantly provided a comfortable level of confidence in the newly developing field of thin walled structures.

In the next phase, the work at AML acquired a much broader and definitive agenda. It included extension of analytical and experimental work on stability of a wide assortment of thin-walled structural elements viz., beams, columns, arches, plane and curved panels, shells and rotating shafts. The bulk of this work, but by far not all, can be found in Dr. Evan-Iwanowski's monograph, *Resonance Oscillations in Mechanical Systems*, published by Elsevier, Amsterdam in 1976.

Dr. Evan-Iwanowski often said that the field of engineering mechanics is not as parochial as the physicists sometimes see it, nor it is as complex as the mathematicians want to make it: it is observable, definable, solvable and applicable. This point of view, and the ability to identify the conceptual and technical essence of the problems in timely areas of mechanics, delineating and solving them using the appropriate analytical and experimental tools, guided Dr. Evan-Iwanowski throughout his didactic, scholarly and technical (in this order) career.

In 1985, after over thirty years of work at AML, Dr. Evan-Iwanowski acquired the title of Professor Emeritus, Syracuse University at the age of 70, a mandatory retirement age at that time. The same year, Dr. Evan-Iwanowski moved to Florida, where he was first a Visiting Professor at the University of South Florida and then at the University Central Florida (UCF). He was proud of his 14 PhDs and over 80 Masters students.

After coming to UCF, he continued to work in nonlinear dynamics using the models of the typical oscillators exhibiting chaotic motion or strange attractors. He organized a weekly brown bag seminar that provided a great impetus to UCF faculty and graduate students to work in nonlinear dynamics. A series of publications resulted from this activity showing (i) stationary chaos may be effectively annihilated by the nonstationary inputs; (ii) nonstationary inputs may create nonstationary chaos; (iii) nonstationary period doubling route to chaos cascades to nonstationary chaos. Dr. Evan-Iwanowski considered the last achievement as a minor break-through, because it may eventually describe the turbulent flow by a more realistic dynamic model. Incidentally, the analysis and experiment performed on a parametrically excited system in 1970 at AML by two harmonic nonstationary forces separated by a few hertz, clearly showed the appearance of nonstationary chaos, unknown at the time, was ignored by Dr. Evan-Iwanowski as a possible anomaly.

It was 1932, a year of the great depression when he received his diploma from the Polish language high school in Harbin, Manchuria. Dr. Evan-Iwanowski moved to Shanghai with the intention of finding employment and saving money to further his education. With the money earned from working at the Shanghai American School as a stoker, Dr. Evan-Iwanowski sailed to Poland in 1933. After the WWII, he arrived in the USA in 1947 as a refugee.

Apart from being an eminent scholar, a true scientist and an outstanding teacher, Ross Evan-Iwanowski was a man of many other talents; he spoke Polish, Russian, Lithuanian, German, French and English, he was an accomplished painter and above all he was a superior human being. Born on October 2, 1914 in Harbin, Manchuria, Dr. Evan-Iwanowski, even after all the accomplishments of highest degree, remained a 'simple' man. Perhaps it is not a mere coincidence that his birthday is the same as that of Mahatma Gandhi.

### **Selected Publications:**

Evan- Iwanowski, R. M., Loo, T. C., 1962. Deformations and stability of spherical shells subjected to the action of the systems of line loads and concentrated loads. Syracuse Univ., Research Inst. (SURI) Report834-5.

Evan- Iwanowski, R. M., Cheng, H. S., Loo, T. C., 1962. Experimental investigations and deformations and stability of spherical shells subjected to concentrated load at the apex. Fourth U.S. Congr. Appl. Mech. 563-575.

R.M. Evan-Iwanowski, T.C. Loo and D.W. Tierney, "Local buckling of shells", *Developments in Mechanics*, Vol. 2, Ostrach, S. and Scanlan, R.H., editors, Pergamon, New York, 1963, pp. 221-251

Loo, T. C., Evan- Iwanowski, R. M., 1964b. Experiments on stability of spherical caps. *Proc. ASCE EM3*:255-270.

Gorman, D. and Evan-Iwanowski, R.M., "Photoelastic analysis of prebuckling deformations of cylindrical shells", *AIAA J.*, Vol. 3, No. 10, 1965

Loo, T. C., Evan- Iwanowski, R. M., 1966. Interaction of critical pressures and critical concentrated loads acting on shallow spherical shells. *J. Appl. Mech.* 33:612-616.

A. Vijayaraghavan and R. M. Evan-Iwanowski, "Parametric instability of circular cylindrical shells", *Trans. ASME*, E34, No. 4, 1967, pp. 985-990

D. J. Gorman and R. M. Evan-Iwanowski, An analytical and experimental investigation of the effects of large prebuckling deformations on the buckling of clamped thin-walled circular cylindrical shells subjected to axial loading and internal pressure, *Develop. in Theor. and Appl. Mech.*, 4 (1970), pp. 415-426.

Evan-Iwanowski, R. M. (1976). *Resonance Oscillations in Mechanical Systems*. Amsterdam: Elsevier Scientific Publishing.