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JOHN DUNDURS—A BIOGRAPHICAL NOTE

John Dundurs (Jānis Valdemārs Dundurs on his birth certificate) was born on 13 September 1922 in Riga as the only child of Jānis Dundurs and Auguste Dundurs, née Reichmanis, who had returned to Latvia after their exile in Russia during the First World War. His father was a musician and his mother had apprenticed as a seamstress. He grew up under modest circumstances, as did most youngsters in a country that had gained its independence from imperial Russia a few years before and was undergoing many economic dislocations. Nonetheless he remembers very fondly his early years and growing up in a family that had the habit of reading books to each other ranging from French and Scandinavian literature, fashionable in Latvia during the twenties, to encyclopedic works on history, geography and zoology. He left Latvia at the very end of 1943, lived in Germany until 1950 when he emigrated to the United States, starting out as a worker on a chicken farm in Michigan and in some manufacturing factories, advancing to an operator of a huge punch press at the Bellwood, Illinois plant of the Borg Warner Corporation. In 1952, he was married to Valda Gaišs from Jelgava, Latvia, with the marriage leading to their three daughters, Nora, Renate and Ilse.

John Dundurs was educated in Latvia, Germany and the United States. In 1940 he graduated from the First Riga City Lycée. Ironically he received the "abitur" entitling him to attend a university one day before the Red Army marched into Latvia, ending the brief independence of his native country between the last two World Wars. Subsequently he studied Mechanical Engineering at the University of Latvia, Technische Hochschule Dresden and Technische Hochschule Stuttgart, but never graduated because of the disruptions caused by the war. He managed to do so only in 1952, receiving a B.S.M.E. from Northwestern University. Having worked for International Harvester Company as a designer of diesel engines for about two years, he returned to Northwestern University for graduate studies leading to an M.S. in 1955 and a Ph.D. in 1958 in Theoretical and Applied Mechanics. His thesis advisor was Miklos Hetényi, a noted experimentalist who was equally at home in theory, and who himself had studied under Stephen Timoshenko at the University of Michigan. After having received his doctorate, he was appointed by Northwestern as an Assistant Professor of Civil Engineering, advancing to Associate Professor in 1961 and Professor of Civil Engineering in 1966. He was retired by Northwestern University in 1993, and is now a Professor Emeritus.

The research of John Dundurs has essentially been in the theory of elasticity and subjects where elasticity alone is sufficient to explain physical behavior. He has on occasion described himself as a nineteenth century elastician by temperament, and one who has managed to discover new things because the old boys failed to be observant. His research has a certain signature: posing the problem in the simplest possible terms, doing mathematics that is just enough, polishing the results so that they become more transparent and

aesthetically pleasing, exploring all limit cases, and leaving no stone unturned to extract physical behavior. More technically, his research has ranged from multiphase elasticity to construction of new Green's functions and a multitude of other singular solutions, behavior of dislocations in the presence of inhomogeneities, effect of elastic constants on the state of stress, analogies between concentrated forces and discrete dislocations, the interface crack, unilateral boundary conditions in elasticity, history effects in contact problems with friction or involving heat conduction, and even the old seismology problem of waves reflecting and refracting from an interface but now under conditions that allow separation and frictional slip. His results, especially the novel Green's functions, have been put to good use by many researchers exploring phenomena that involve diverse conditions at an interface between two solids.

Many of his findings are likely to have a lasting value, but three of his discoveries stand out more strongly because they qualify as general results in elasticity of which there are few.

The first is connected with the famous conclusion by J. H. Michell going back to the turn of the century: stresses under plane deformations do not depend on Poisson's ratio when boundary tractions are specified and there are no net forces acting on closed contours (the Michell condition). It may be recalled that the Michell conclusion was the life blood of photoelasticity—a field that provided the only means of accurate stress analysis before the onslaught of numerical methods. In 1967, Dundurs showed [27] the explicit dependence of stresses on Poisson's ratio when the Michell condition is not satisfied. His result is that the stresses can be computed by a certain interpolation for any Poisson's ratio if they are known for only two specific values of this ratio.

His second discovery, also going back to 1967 [23], is that the state of stress in a bimaterial under a large variety of conditions at the interface shows a reduced dependence on the elastic constants. After some polishing of these results, he proposed in 1969 [38] the eponymous Dundurs constants α and β as measures for the mismatches in the elastic compliances, and the associated Dundurs parallelogram with interesting geometric properties. A considerable amount of literature has accumulated over the years on this subject either taking advantage of this discovery or extending it.

His third discovery, following some seminal work with Marvin Stippes [43], is that it is meaningful to classify contact between elastic bodies as either advancing or receding. The classification is mathematically sharp and provides a distinction between two entirely different types of physical behavior when two bodies are pressed together. Very little can be said about advancing contact, but Dundurs showed in 1975 [69] that receding contact has a multitude of general properties which simplify thinking and computations.

John Dundurs is a Fellow of the American Society of Mechanical Engineers, the Society of Engineering Science, and the American Academy of Mechanics. He is also a Member of the Society of Civil Engineers, and in 1976–1977 he served as the Chairman of the Engineering Mechanics Division of ASCE. In 1990 he was awarded the Theodore von Kármán Medal by the American Society of Civil Engineers.

All numbered references mentioned can be found in the list of publications by John Dundurs.