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Burzyński, Włodzimierz Stanisław Trzywdar



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Family and Education

Włodzimierz Stanisław Burzyński was born on the 29th of April 1900 in Przemyśl, a border town of the Austro-Hungarian Empire, into the family of a secondary-school teacher of physics in Przemyśl. His father Marian Jan Tomasz Trzywdar Burzyński graduated in Kraków from the Cracow University in physics and astronomy and received the PhD degree in physics, his mother Wanda (maiden name Rutkowska) passed away prematurely when Włodzimierz was only 3 years old. Burzyński family originated of old Polish gentry with noble *Trzywdar* (*tria in donum*) coat of arms since 1611. Therefore, in many of his earlier publications it is given: *Włodzimierz Stanisław Trzywdar Burzyński*, however later just *Włodzimierz Burzyński* has been used. After the ground school he attended since 1910 the high school in Przemyśl called that time “Gimnazjum”, from which he graduated with very good notes in June 16, 1918. During the years 1918–1925, he studied in Faculty of Civil Engineering at Lwów

Polytechnic. This rather trivial statement is not so obvious in this part of Europe in the first years after the 11th of November 1918, when Poland after 123 years of partition regained freedom. The 18-years-old Włodzimierz Burzyński, already as a student of the Lwów Polytechnic (still officially named as the Imperial and Royal polytechnic school in Lviv), joined the Polish Army as a volunteer and took part in the fighting against the Ukrainians in the defense of Lwów (1st November – 16th December 1918). Next he undertaken the studies and again joined the Polish Army for the second time (4th–22nd August 1920) to fight the bolsheviks. For the third time he joined the volunteers and took part in the Silesian Uprising (3rd May 1921–26th of July 1921 in Upper Silesia). Finally, he defended his civil engineering diploma with distinction on 12th of June 1925. In 1922 student W. Burzyński became an instructor at the Lwów Polytechnic and in 1925 he became an assistant of professor M.T. Huber. On February 15, 1925, W. Burzyński married Irena Wanda Walkowicz and settled down in Lwów and they lived two sons: Maciej (* May 16, 1929) and Jacek (* April 4, 1931, † March 17, 1966).

Professional Carrier

Under the supervision of professor M.T. Huber Włodzimierz Burzyński prepared his pivotal work on the strength hypotheses proposing a new and original energy-based strength theory

of materials revealing strength differential effect (SDE) and obtained the Ph.D. degree in May 1928. A postdoctoral grant from the Polish Culture Fund enabled him to spend 8 months, first in Göttingen, December 1928–March 1929, where he had opportunity to meet and discuss with L. Prandtl, Th. Von Karman, and R. von Mises and then in Zurich Polytechnic (Eidgenössische Technische Hochschule), April–August 1929, where he worked with M. Roß. W. Burzyński obtained the D.Sc. degree for his habilitation thesis on continuum mechanics in 1932 and received the title of professor at the Lwów Polytechnic from the President of the Republic of Poland on the 29th September 1934.

He was a scientist, who contributed to development of mechanics of solids and structural mechanics. He was also active as an engineer achieving success in civil engineering projects, the most important one was the reinforced concrete arch bridge built in 1936 on the river Sola in Tresna, Czernichów. As a result of an open competition, W. Burzyński became the successor of professor M.T. Huber at the chair of mechanics. In 1938 professor W. Burzyński was elected a corresponding member of the Academy of Technological Sciences in Warsaw, and a member of the editorial board of the “Zentralblatt für Mechanik.” In the same year he was elected the dean of the mechanical faculty. During the soviet occupation 1939–1941 he was active being an unofficial representative of Polish faculty members in front of the repressive soviet authorities of the Polytechnic. When German occupation of Lwów started, the 29th June 1941, the Polytechnic was closed and Burzyński began to work as the building foreman in the city of Lwów construction office. After few months, German occupation authorities organized lower level courses “Staatliche Technische Fachkurse Lemberg” instead of the Lwów Polytechnic engineering and master degree studies. Burzyński in agreement with the representative of the Polish government-in-exile in London accepted the proposition to take the position of vice-director of such a school. He taught the courses on mechanics and strength of materials. After the mobilization of the Ukrainian students (1943)

to SS division “Hałyczyna,” the programs of the courses for Polish students could resemble, within the framework of the secret underground education, those of the Lwów Polytechnic ones. In July 1944 the town was overtaken by the Red Army and Polytechnic was reopened under a new name and new soviet orders. W. Burzyński was appointed the deputy director of the school for scientific matters. On the 4th of January 1945, he was arrested with a number of the other distinguished professors and spent in soviet prison in Lwów over 7 months. After release from prison he spent another year in Lwów teaching students and doing the research. Professor W. Burzyński left Lwów in July 1946 and went to the Silesian Institute of Technology in Gliwice, Poland, where he became the head of two chairs: that of the Technological Mechanics on the Faculty of the Mechanical Engineering and that of the Strength of Materials in Civil Engineering Faculty. In August of 1946 W. Burzyński was elected by an assembly of teachers and students, the new Rector of the school. Unfortunately, the regulations have changed and for over 30 years there were no elections of the rectors, deans, etc., any longer in all the academic schools in the Polish People’s Republic. Suddenly, in October 1949, his scientific career was abruptly terminated by an incurable neurological disease. In spite of this he was elected a member of Cracow Polish Academy of Letters, a member of the Warsaw Scientific Society, and an honorary member of the Polish Society of Theoretical and Applied Mechanics. It is worthwhile to note that the aforementioned biographical note is based on earlier works (Szewalski 1982; Olesiak 2008; Olesiak and Pęcherski 2013) and the comprehensive monograph of 473 pages containing the reproductions of large number of original and first time published documents, (Bąba and Mercik 2018). In this book also much place is devoted to describe the achievements of W. Burzyński in the field of the organization of faculties, research groups, and laboratories of mechanical testing of materials as well as teaching of mechanics and strength of materials at Lwów Polytechnic and at Politechnika Śląska in Gliwice (recently Silesian University of

Technology). The monograph contains also many memories of Burzyński's students, co-workers, and friends.

Scientific Achievements

One of greatest scientific achievements of Włodzimierz Burzyński is contained in his doctor thesis (Burzyński 1928, 2009) and further papers (Burzyński 1929a, b, 2008). The doctor thesis contains the comprehensive and critical study of all his contemporary strength (material effort) hypotheses and the novel theory for isotropic materials revealing the strength differential effect (SDE). The new strength theory is based on the original partition of elastic energy density into the contribution of the elastic energy density of volume change, which is controlled by mean stress and the elastic energy density of distortion. He proposed also the pioneer approach to anisotropic solids, in particular of orthotropic symmetry, using the own concept of anisotropic material but with isotropic volume change. Such a class of materials is called now the Burzyński materials, (Rychlewski 2011; Ostrowska-Maciejewska et al. 2013). He derived the unique partition of elastic energy density into two components: the first one is responsible for isotropic volumetric changes and the second one is corresponding to anisotropic distortions. Such a partition makes a basis for the formulation of the strength criteria applicable for the orthotropic materials or transversally symmetric ones. In particular, the transition to the model of isotropic material is discussed that approximates "a slight effects of anisotropy" as for instance in the materials in "as-received" state. The theory of material effort developed by Burzyński had great impact on the recent studies on the yield condition accounting for SDE, (Vadillo et al. 2011) and for the third invariant of the stress deviator (Pęcherski et al. 2011). Among the papers related with structural mechanics, in particular problems of stability and buckling accounting for inelastic range, as well as with the design and engineering problems of building of bridges and hydro-technical facilities two theoretical works appeared par-

ticularly significant in the scientific output of W. Burzyński. They were related with his habilitation thesis, (Burzyński 1932), published in 1932 and his habilitation lecture delivered on the 20th of March 1933 that was published in an extended version in (Burzyński 1933). In these papers, one can find fresh ideas concerning the nonlinear elasticity theory that some years later were undertaken by Mooney (Mooney 1940). In the last scientific work (Burzyński 1951), the author presented the comprehensive analysis with high level of mathematical precision the problem of the Saint-Venant's theory of straight bars. Later on similar question attracted attention of other researches, e.g., R.A. Toupin (Toupin 1965) and E. Sternberg (Sternberg 1954).

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