

*EDMUND WITBRODT\**

### PROFESSOR JAN KRUSZEWSKI-MAJEWSKI (1929-2012)

In this obituary, we present the life and achievements of an outstanding Polish scientist, Professor Jan Kruszewski-Majewski, who passed away in 2012. Professor Kruszewski-Majewski was one of the pioneers in introducing modern numerical methods in mechanics. He created and developed an original, Polish method of modelling called the rigid finite element method. He was not only an outstanding scientist, but also a person of great charisma and moral rectitude.



Fig. 1. Profesor Jan Kruszewski-Majewski, 1995

Professor Jan Kruszewski-Majewski passed away on 30<sup>th</sup> July 2012, at the age of 83.

Jan Kruszewski-Majewski was born in Warsaw on 28<sup>th</sup> May 1929. In 1948, he graduated from a high school (lyceum) in Gdańsk, from which he brought his background in mathematics and physics. In the same year, he entered the Gdańsk University of Technology, starting his studies at the Faculty of Mechanical Engineering. He took the specialisation of 'design of motorcars

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and tractors', and was awarded the diploma of a Mechanical Engineer in 1952. After completing a one-year diploma internship at a truck factory in Starachowice (Starachowickie Zakłady Samochodów Ciężarowych), he began his postgraduate studies at the Faculty of Mechanical Engineering of Gdańsk University of Technology, which he completed in 1954, obtaining the master's degree. During his postgraduate studies, Jan Kruszewski-Majewski was already employed as a teaching and research assistant at the Department of Strength of Materials, which at that time was headed by Prof. Jarosław Naleszkiewicz (subsequently Prof. Jerzy Rutecki took over this post). Jan Kruszewski-Majewski was involved *inter alia* in calculating vibrations of shaft propellers and measuring vibrations of generator units. In the following years, he started working towards his doctorate, with Professor Jerzy Rutecki as his supervisor. He presented an outstanding thesis entitled 'Torsional vibrations of ship propulsion systems with flexible couplings' (*Drgania skrętne układów napędowych ze sprzęgłem elastycznym*), for which he was awarded a PhD degree in science and technology at the Faculty of Mechanical Engineering of Gdańsk University of Technology. From November 1970, Jan Kruszewski-Majewski occupied the position of a senior lecturer at this Faculty. During this period he started his original research on numerical methods in mechanics, which he completed with an outstanding postdoctoral ('habilitation') thesis entitled 'Application of the Rigid Finite Element Method in Calculating Complex Natural Frequencies of Linear Systems' (*Metoda sztywnych elementów skończonych w zastosowaniu do obliczeń częstości drgań własnych złożonych układów liniowych*). His postdoctoral thesis was published in scientific periodicals 'The Scientific Journal of Gdansk University of Technology' (*Zeszyty Naukowe Politechniki Gdańskiej*) No. 165, and 'Mechanics' (*Mechanika*) No. 12, 1971. In recognition of his work, in 1972, he was awarded the degree of an associate professor. Five years later, in 1977, he was awarded a professorship at the Faculty of Mechanical Engineering. Despite his undeniable achievements, he had to wait until 1989 to be promoted to the title of a full professor.

Professor Kruszewski-Majewski is widely known as the creator of an original calculation technique called the rigid finite element method. A description of this new approach appeared for the first time in the article entitled *Application of the Finite Element Method to Calculations of Ship Structure Vibrations (Theory)*, which was published in the European Shipbuilding Journal of the Ship Technical Society, No. 3, Vol. XVIII, 1968. Prof. Kruszewski-Majewski used this method to develop many computer programs, including those used for the analysis of torsional vibrations in V-type propulsion systems, flexural vibrations of ship hulls, and vibrations in fixed equipment.

Updated and adapted to modern computers, these programs continue to be applied in Poland's shipbuilding industry to this day.



Fig. 2. Prof. Jan Kruszewski-Majewski in conversation with Prof. O.C. Zienkiewicz

In the seventies, the rigid finite element developed dynamically, yielding hundreds of papers published in scientific journals both in Poland and abroad. Professor Kruszewski-Majewski created a group of fellow scientists that is widely known in Poland. Among his co-workers, a large number of young researchers graduated to the doctor's, associate professor's as well as professor's degree. Some of them have pursued successful careers in scientific research centres in Germany, the USA and Canada. The rigid finite element method has also been applied in other research centres worldwide.

Professor Kruszewski-Majewski was an excellent academic teacher, often winning awards from students. At the Gdansk University of Technology, he lectured in the subjects of: General Mechanics, Strength of Materials, Theory of Vibrations, Theory of Machines and Mechanisms, Fundamentals of Automatic Control, Finite Element Method, Informatics and Applied Computer Methods in Mechanics.

From 1958 to 1968 Jan Kruszewski-Majewski was also employed as an associate professor at the Higher Naval School (currently the Naval Academy) in Gdynia, where he lectured in Mechanics and the Strength of Materials. He participated in college cruises organized by the Academy, for example along the coast of Norway to the North Cape. In 1961-64, he also worked for the Centre of Ship Technology, calculating and measuring ship vibrations. He measured vibrations during many sea trials of ships built in Polish shipyards. Owing to this experience, he was able to verify his method on the basis of measurement results obtained from real vessels. Professor Jan Kruszewski-Majewski pioneered computer methods in the shipbuilding industry. The first Polish computer program for the analysis of torsional vibrations in marine propulsion systems was developed by Prof. Kruszewski-Majewski for the com-

puter Elliot 803, the first transistor-based computer available in Poland that time. This program was later purchased by the Swiss company Sulzer, a leading company producing internal combustion engines.

Today, with sadness and reverence, we say farewell to an exceptional man, a great academic teacher and long-standing full professor of the Gdańsk University of Technology. The entire professional career of Professor Kruszewski-Majewski was associated with this University. It is hardly possible to mention in this brief note all his activities, achievements and services. He received not only countless ministerial and university awards, but also many state awards, including the Silver and Gold Cross of Merit, the Cross of the Order of Polonia Restituta of Chevalier and Officer Degree, and the Medal of the National Education Commission. He was a founding member of the Gdańsk Branch of the Polish Society of Theoretical and Applied Mechanics, which later granted him the title of an Honorary Member. He also actively participated in the work of the Gdańsk Scientific Society.

As a result of his life-long scientific work, Professor Kruszewski-Majewski proved that much research remains to be done in mechanics, which had previously been considered a closed discipline, and that many achievements can still be expected in this field. He was the author of an original Polish method of modelling and analysing the dynamics of complex mechanical systems, called the rigid finite element method. He was one of the pioneers who greatly contributed to implementing and developing computer methods in mechanics.

Professor Kruszewski-Majewski was not only an engineer and scientist, but also a man of culture. He especially loved music, himself playing the accordion, and was a devoted amateur photographer. His favourite leisure activity was hiking, especially in the mountains and in the region of Kashubia.

His attitudes toward other people, the colleagues and especially students, were always marked with great respect. Everyone could count on him, on his helpful advice and kind remarks. As an academic teacher he gained a considerable standing and respect. In a nationwide poll in the 1970s, he was recognised as the best academic teacher in Poland. The students willingly attended his lectures and followed them with great interest, because Professor Kruszewski was able to skilfully combine his vast theoretical knowledge with broad practical experience, and present it in an attractive and accessible form.

For co-workers, colleagues and friends Prof. Jan Kruszewski was a great moral authority, someone able to wisely distinguish between right and wrong, between truth and falsehood. This was particularly noticeable in the difficult period of the 1980s. For many people, he was a source of strength and moral support, especially for those who struggled for the freedom and independence of Poland. He defended fellow workers and students actively engaged in this

struggle, who were persecuted by the communist regime. The personal price he paid for this was that he was denied the right to travel abroad, and his promotion to a full professorship was postponed for several years. Then, after the change in the political system, three of his close associates were offered ministerial posts in the Polish government, which might have well given him a reason for pride and satisfaction.

Prof. Jan Kruszewski was a person who, despite all adversity, successfully realised his aims in life, and fulfilled all obligations to society. There were many outstanding achievements in his life, not only in science, but also in educating young people and supporting the development of their careers. His family constituted an extremely important part of his life. He was deeply attached to his loved ones, and drew strength from these emotional relationships. This is clearly stated in the autobiography he wrote in 1998, entitled 'Recollections from My Life' (*Wspominki z mojego życia*). There he wrote 'I dedicate this book to those I love' and added the motto: 'The world is beautiful and we in it!'

The world is indeed beautiful, because there are people, like the departed Prof. Jan Kruszewski-Majewski, who devote their lives to change it for the better. For all he has done, his students and co-workers would like to thank him and express immense gratitude. We say farewell to a wonderful person, an exceptional scientist and academic teacher, a man of culture, and a team leader who had very high standing yet was an exceedingly modest person.

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#### **Profesor Jan Kruszewski-Majewski (1929-2012)**

#### **Streszczenie**

W artykule przedstawiono życiorys i najważniejsze dokonania zmarłego w 2012 roku prof. Jana Kruszewskiego-Majewskiego. Należał do prekursorów wdrażania metod komputerowych w mechanice. Jest pomysłodawcą oryginalnej, polskiej metody modelowania zwanej metodą sztywnych elementów skończonych. Profesor był nie tylko wspaniałym naukowcem, ale także wielkim autorytetem moralnym.