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JÓZEF JOACHIM TELEGA (1943–2005)

Managing Editor of the *Archives of Mechanics* (1999–2005)

OBITUARY

J. Joachim Telega was born in Przyszowice in Poland on March 24, 1943. He received two Master's degrees: in 1968 at the Technological Department of the Silesian University in Gliwice and in 1970 at the Mathematics, Physics and Chemistry Department of the same University. He had been working there until the 1977 and received his Ph.D. degree in 1972. Since 1977 until the last days of his life he had a permanent position at the Institute of Fundamental Technological Research (IFTR), Polish Academy of Sciences in Warsaw, becoming full Professor here in 1999. Since 2001 he was the head of the Division of Variational Methods and Biomechanics of the Department of Mechanics of Materials and Biomechanics.

J. J. Telega was editor-in-chief of the Polish survey journal on mechanics (*Polska Bibliografia Analityczna Mechaniki*) in years 1984–1991. He was a member of numerous scientific societies and the editorial boards of international journals: *Applied Mechanics Reviews* (since 1992 – as technical editor and associate editor), *Archives of Mechanics*, *Acta of Bioengineering and Biomechanics*, *Russian Journal of Biomechanics*, and *Applied Mathematics* (*Matematyka Stosowana*). During the last years he edited twenty five volumes of Lecture Notes and Conference Proceedings of the Centre of Excellence for Advanced Materials and Structures (AMAS). He was also editor-in-chief of the *IFTR Reports* series since 1991, and a member of the editorial board of the monographs in the *Series on Applied Mechanics*. J. Joachim Telega was a member of a number of scientific committees of international conferences; in the last decade he organized numerous workshops, seminars and courses, mainly on biomechanics.

The range of scientific interests of Professor Telega was very broad. His unusual activity is reflected in over 300 publications he authored or co-authored, mainly papers in international journals and several monographs.

The first papers by Joachim Telega, published in years 1970–1971, inspired to some extent by Antoni Sawczuk, his cordial friend, concerned the limit load theory of skeletal structures and plates. J. J. Telega generalized the limit load theorems to incorporate independent rotations in the continuum formulation by considering the limit load problems for micropolar media. Years 1976–1982 brought his new results of determination of the potential form of operators. Telega generalized the method of F. Magri to the broader class of nonlinear operators, providing the method for deriving new variational principles for deformations of rigid-plastic solids obeying non-associated flow laws. This contribution, along with further results on variational formulations for finite elasticity in the presence of non-potential loadings, strengthened the authority of Joachim Telega among specialists in the continuum mechanics. In these papers one notes a peculiar feature of his works: getting to the core of the mathematical essence of the problem, abstracting it and then solving by appropriate, modern, sometimes advanced methods, yet without any escape into mathematical abstruseness.

In the eighties, the scientific interests of J. J. Telega were directed to the theory of representation of tensor functions, with a special emphasis put on its applications in plasticity. An independent stream of Telega's works concerned the non-classical contact problems, in particular the contact with friction. He participated in developing a new dual formulation of contact problems with friction and in developing the dual form of the obstacle problem for the von Kármán plates. The problems of contact with friction were the subject of Telega's lectures in CISM, Udine, published in 1988. The dual approach to the contact problem with friction was a part of his Habilitation Thesis: "Variational methods and convex analysis in contact problems and homogenization" in 1990. Just recently, Telega has come back to the contact mechanics problems; his newest results have been published in the book co-authored by him: *Models and Analysis of Quasistatic Contact. Variational Methods*, Springer, Berlin 2004.

Since late 70-th the progress in the homogenization theory inspired Joachim Telega to extend the method to the problems concerning arches, plates, laminates and shells of repetitive structure and to the coupled fields problems of composites. He mastered the energy method of homogenization, specific two-scale asymptotic methods, the epi-convergence and the Γ-convergence techniques, also in the dual setting, for plates and shells modelling. He noted that the homogenization process for shells and plates should be viewed as indissolubly bonded with the process of formation of the two-dimensional model. His original results on the topic are included in the book he co-authored: *Plates, Laminates and Shells. Asymptotic Analysis and Homogenization.* World Scientific Publishing; 2000. The book comprises the original Telega's contribution to the theory

of plates of moderate thickness, von Kármán plates, elasto-plastic plates and thin shells as well as plates weakened by regularly distributed cracks. Later J. J. Telega solved, in a joint paper, a very difficult problem of homogenization of periodic media with locking, having in view possible applications in the cellular bones mechanics.

The results of Telega on homogenization of piezoelectric materials with regular or random variation of the microstructure were pioneering in the literature on homogenization of piezocomposites, including also thermal effects. His formulae were soon generalized to the dynamic case and implemented into FEM codes. A deep exposition of the subject of stochastic homogenization has been recently given by J. J. Telega in his article published in the proceedings co-edited by him and published by Kluwer, Dordrecht, 2004.

Since early nineties Telega has turned his scientific interests to biomechanics. He has enlarged his knowledge by further studies in the fields of biology, biochemistry and biophysics, as well as in more specific fields like physiology or histology. Being severely handicapped by his illness, having experienced introduction of four joint implants, he initiated at IFTR a laboratory for research into modeling of biomechanical aspects of joints implantations. He was head of many research projects conducted, of interdisciplinary profile, linking the results of research done by clinicians, experimental biologists and specialists in continuum and computational mechanics. The projects were concerned with the biomechanics of bones, muscles and articular cartilages, orthopaedic biomechanics and in electromechanical effects in living tissues (bones, cartilage, etc.). This activity has been continued within the framework of the Centre of Excellence for Applied Biomedical Modelling and Diagnostics ABIOMED formed in 2002 within the IFTR. Telega became the scientific coordinator of the Centre.

Orthopaedic biomechanics has been one of main interests of J. Joachim Telega and his team in his last years. He was involved in research related to mechanical reasons for short- and long-term failure of total joint replacement surgery. On the other hand, his special models of contact with adhesion has been developed for interfaces in joints with implants to study loosening of implants due to debonding at the contact interface. Further investigations of the interface have been extended to take into account wear and influence of wear debris on weakening of adhesive bonds. His recent research project included studies over biological aspects of implant loosening caused by the products of wear.

In his last, heroic months of life, being critically ill, having suffered from a serious disability, he prepared hundreds of pages of the monographs envisaged, their titles being: *Young measures and their applications in micromechanics and optimization. Part II. Applications; Contact Problems for Solids and Structures Undergoing Large Deformations; Heat Transfer Problems in Biomechanics; Biomechanical aspects of fracture healing; Controllability and stabilization of linear and nonlinear plates and shells.* Unfortunately, the untimely death thwarted his

plans of finishing these books and hindered from editing of other nearly completed papers.

J. J. Telega had unbelievable reserves of spiritual energy. His life was devoted to work, despite his illness. Yet he coped with it, making up by continual work and perfect organization the time he lost for having medical treatment. Passing away on January 28, 2005, Joachim Telega deprived us of his uncommon personality. Poland has lost an outstanding scientist. We have lost a sincere friend, a teacher and a guide.

Barbara Gambin and Tomasz Lewiński
and the Editorial Board