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**18th INTERNATIONAL CONFERENCE ON
COMPUTER METHODS IN MECHANICS**

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Editors:

M. Kuczma
K. Wilmański
W. Szajna

Zielona Góra 2009

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Welcome address

The 18th International Conference „Computer Methods in Mechanics“, CMM2009, takes place at the University of Zielona Góra, Poland. The city of Zielona Góra where the campus of the University is located, along with the city of Gorzów Wielkopolski, is a joint capital of The Province of Lubuskie, which is a picturesque and heavily forested western part of Poland. The history of Zielona Góra (ger. Grünberg) goes back to the 13th century. Its location on the trade route from Berlin to Upper Silesia has favoured the shaping of a multitude of contacts with other regions and countries. The city is located 125 km from Poznań and 180 km from Berlin, and has a population of 120,000 people. More and more tourists visit the city not only to celebrate the Wine Festival, which has been held annually every September since 1852, and the Song Festival, but to also see the historic buildings, beautiful countryside, forests and lakes around the city. Historical monuments include the late-Gothic Church (mid-15th century), half-timbered church (18th century), remnants of old fortifications, and the palm house cafe surrounded by a vineyard.

The University of Zielona Góra was founded on 1 September 2001 as a result of a merger between Zielona Góra's Pedagogical University and Technical University. The University comprises ten faculties, which provide education for about 18 thousand students within 39 areas of study and different types of courses (full-time and part-time ones) conducted at various levels (undergraduate, graduate, postgraduate and doctoral). All faculties use the European Credit Transfer System, which facilitates partial study abroad. Thanks to the University's co-operation with foreign institutions, students have the opportunity to participate in European Union exchange programs, such as Erasmus, while academics can take part in staff exchange and international research projects, for example, within the Framework Programs.

The University of Zielona Góra was entrusted with organizing the CMM2009 by a steering committee as a recognition of scientific achievements of coworkers of this University as well as a way to promote this region of Poland. The CMM2009 continues the 36-year tradition of the Polish Conferences on Computer Methods in Mechanics. The Conferences started in 1973 and have taken place every second year. The main idea of these Conferences is universal - to provide a forum for presentation and discussion of new ideas regarding the theoretical background and applications of computational mechanics. It is organized by the Polish Academy of Sciences (Division IV Technical Sciences) and the Polish Association for Computational Mechanics and the University of Zielona Góra under the auspices of the European Community on Computational Methods in Applied Sciences and the Central European Association for Computational Mechanics. Two sections of the PAS are involved in the organization of the CMM2009: the Section of Computer Methods in Mechanics (Committee on Mechanics) and the Section of Mechanics of Structures and Materials (Committee on Civil Engineering and Hydroengineering).

The Conference CMM2009 is the biggest of all conferences of this series up to now. All the members of the Local Organizing Committee with his secretary, dr. Waldemar Szajna, have been working very hard to prepare a high quality technical programme. For a rather small town of Zielona Góra and its relatively new University the international conference of 300 participants was a real challenge. Numerous lecture halls had to be adjusted to the requirements of the conference, the accommodation in a few local hotels had to be arranged, the lunches, receptions and other events had to be organized. The Conference is preceded by a short course on the *hp*-adaptive FE methods. Herein we would like to express our appreciation for the devotion of the members of this Committee and the free time they have offered to the CMM2009 during the last months.

The Conference CMM2009 is accompanied by a few events related to the death of the outstanding scientist and the grounder of computational methods in mechanics – Professor Olgierd C. Zienkiewicz. His memory will be celebrated in the mass service and a memorial presentation, O.C. Zienkiewicz Memorial Lecture will be delivered and the O.C. Zienkiewicz Medals of the Polish Association for Computational Mechanics will be awarded to the outstanding researchers for their scientific achievements in computational mechanics.

The Marshal of the Lubuskie Province – Marcin Jabłoński, the Mayor of the city of Zielona Góra – Janusz Kubicki, and the Rector of the University of Zielona Góra – prof. Czesław Osekowski, have accepted the patronage of the Conference CMM2009 and supported it in many respects including a generous financial donation. (Zrealizowano przy pomocy finansowej Prezydenta Miasta Zielona Góra – Janusza Kubickiego.) The Polish Academy of Sciences has also supported the Conference. We are very thankful for all this support.

We wish to thank the following firms who have also supported financially the Conference CMM2009: Vattenfall, PGNiG Zielona Góra Branch, BUDSOFT, ADB, ITA, Kronopol, Diament, Rockwool, Strabag.

The papers will be presented in 6 parallel sessions within 14 Minisymposia, 8 Thematic Sessions and 2 Industrial Sessions. Furthermore, 11 Plenary Lectures will be delivered. We would like to thank the authors for submitting their papers, and the organizers of Minisymposia for their help. We hope that besides this very intensive scientific programme you will have a chance to relax a bit and meet friends, browse the books on the conference book exhibition, and take part in the social activities we have prepared, particularly in the concert at the Zielona Góra Philharmony, regional products tasting and the banquet in the Palm Hause.

We wish you a nice stay in Zielona Góra and good impressions of the Conference CMM2009.

Mieczysław Kuczma

Krzysztof Wilmański

Co-chairmen of the Conference CMM2009

In memory of Professor O.C. Zienkiewicz

Professor Olgierd Cecil Zienkiewicz, Professor of applied mechanics, a civil engineer, one of the pioneers of the finite element method, one of the greatest mechanicians of the 2nd half of the 20th century, the recipient of many honours and medals died on January 2nd, 2009 in Swansea.

Prof. O.C. Zienkiewicz was the highly respected Nestor of the world-wide computational mechanics and for beyond this field and the very influential great scientist. Moreover he had a humanistic view of the world, and he was a reliable personal friend. We lose an outstanding scientist and true friend whose memory will surely remain vivid in all our minds.

Prof. O.C. Zienkiewicz was born in 1921 in Caterham, Great Britain, as a son of Kazimierz Zienkiewicz and Edith Violet Penny. Since 1922 he lived in Katowice, Poland, where his father was a district judge. He finished secondary school in Katowice in 1939. Due to the outbreak of the World War Two he did not start studies at Warsaw University of Technology. He studied in Great Britain. In 1943 he graduated with first class honours from Imperial College and obtained his B.Sc. there. In 1945 he obtained his Ph.D. and DIC (Diploma Imperial College) as a member of Sir Richard Southwell's research team. In 1946 he obtained his engineer's degree at Polish University of Technology in London and in 1965 his D.Sc. (Eng) at the University of London.

In the late 1940s Prof. Zienkiewicz worked as a Consulting Engineer, from 1949 till 1957 he was a lecturer at the University of Edinburgh. From 1957 till 1961 he was a professor of structural mechanics in Northwestern University, Evanston, Illinois, USA. Since 1961 he was associated with the Department of Civil Engineering, the University of Wales, Swansea, UK. Prof. Zienkiewicz established the Institute for Numerical Methods in Engineering and was its Director till 1988, when he retired. He created a scientific school in Swansea, which soon became the world leading centre in the field of numerical methods. Here he developed the finite element method (FEM) – the main work of his life.

After retirement from Swansea in 1987, Olek spent two months each year at the International Center for Numerical Methods in Engineering (CIMNE) at Universitat Politècnica de Catalunya (UPC) in Barcelona, Spain. In 1989 Olek was appointed to the UNESCO Chair of Numerical Methods in Engineering at UPS. This was the very first UNESCO Chair in the world.

FEM has become an irreplaceable method in the analysis of complex problems of solid and fluid mechanics, in all fields of engineering, e.g. acoustics, heat conduction, biomedical engineering, electromagnetics, coupled and multiphysics problems. Professor's activities aiming at the inner development of FEM are also worth mentioning. Among many problems developed in Swansea one can find the relations between FEM and other approximation methods (like finite difference method, the boundary element method, meshless methods), especially in the field of coupling these methods and taking into account an adaptive FE choice.

Prof. Zienkiewicz's genius caused that his knowledge and intuition, his abilities to model and formulate algorithms opened not only new scientific horizons but also encompassed application possibilities of solving different engineering problems. Additionally, his capability to build research teams attracted outstanding students and young academics. It is worth emphasizing that Professor Zienkiewicz school soon achieved world standards and was distinguished by openness and wide international co-operation. Software created in Swansea was from the beginning in the public domain. It was continuously modernized and widened to fit the growing applications and abilities of better and better computers and computer networks.

Professor Zienkiewicz published nearly 600 papers and wrote or edited 25 books. His first paper published in 1947 dealt with numerical stress analysis of dams. He wrote the first book on FEM (*The Finite Element Method in Structural Mechanics*, McGraw Hill, 1967). His next book was published in 1971 and then many times revised till its three-volume 6th edition in 2005. It was edited with Prof. R.L. Taylor from Berkeley University, California – a former student of Prof. Zienkiewicz – is regarded as a basic reference and the best textbook on FEM.

Another field in which Professor Zienkiewicz was very active is the organization of science. In 1968 in Swansea he founded with Prof. R.H. Gallagher from USA *International Journal for Numerical Methods in*

Engineering, which has become the major journal concerning FEM and other computational methods. Professor was the editor-in-chief of the journal till 1988, he was also a member of editorial boards of other leading journals dealing with numerical methods.

Professor Zienkiewicz was the founder and the 1st President of the International Association of Computational Mechanics (IACM) 1986-1990. Nowadays, national associations of computational mechanics from all states that count on the world scientific map and regional associations are affiliated to IACM. He was also one of the founders of the European Community of Computational Mechanics and Applied Science (ECCOMAS). He was a member, the honorary chairman and the author of a huge number of general lectures on many regional and national computational mechanics conferences, as well as on conferences dealing with the applications of numerical methods FEM in science and technology.

Professor Zienkiewicz great prestige is the result of not only his achievements and scientific activity but also of his personal features, among which it is worth to mention the communicativeness of his papers and lectures, the criticism concerning his own results, kindness to young academics, openness and will to share his achievements with others. He supervised over 70 Ph.D. students, not only in Swansea, but also in many other universities, where he was Visiting Professor or during short-term visits. Professor Zienkiewicz was also a scientific consultant of many companies and concerns (e.g. Rolls Royce, English Electric, Sir William Halerow & Partners).

He was a member of many academies of science, among others: Fellowship of the Royal Society, U.K., 1979; Fellowship of the Royal Acad. of Engng., U.K., 1979; US National Acad. of Engng., 1981; the Polish Academy of Science, 1985; Accademia Nazionale dei Lincei, Roma, 1999; Accademia di Science Lettere, Milano, 1999.

He received Honorary degrees from many universities: Laboratorio Nacional de Engen. Civil, Lisboa, Portugal, 1972; Univ. of Ireland, 1975; Vrije Univ. Brussel, Belgium, 1982; Northwest Univ., USA, 1984; Techn. Univ. Trondheim, Norway, 1985; Chalmers Univ. of Technol., Göteborg, Sweden, 1987; Univ. of Dundee, Scotland, 1987; Dalian Inst. of Technology, China, 1987; Warsaw University of Technology, Poland, 1989; Cracow University of Technology, Poland, 1990; Techn. Univ. Budapest, Hungary, 1992; Univ. of Hong Kong, 1992; Compiègne Univ. of Technol., France, 1992; Univ of Wales, UK, 1993; Brunel Univ., London, UK, 1993; Aristotle Univ. of Thessaloniki, Greece 1993; Imperial College of Sci., Technol and Medicine, London, UK, 1993; Ecole Normale Sup. de Cachan, Paris, France, 1997; Universidad Politecnica de Madrid, Spain, 1998; Univ. Buenos Aires, Argentina 1998; Chinese Acad. Sci., 1998; Techn. Univ. Lisboa, Portugal, 2001; Silesian University of Technology, Gliwice, Poland, 2001; Politecnico di Milano, Italy, 2001; Czestochowa University of Technology, Poland, 2005. The received also many awards and distinctions.

Professor Zienkiewicz was in touch with his family in Poland and his schoolmates in Katowice. In Swansea he received trainees and Ph.D. students from Poland. Since the mid 1960s he was in close contact with Prof. J. Szmelter from Lodz University of Technology, later Military University of Technology, Warsaw – the creator of the Polish school of FEM and Prof. I. Kisiel from Wroclaw University of Technology, who translated into Polish Professor's book *The Finite Element Method*, Arkady, 1972. Prof. Zienkiewicz attended Polish Conferences on Computational Mechanics since 1981, the honorary chairman since 2001, the invited honorary member of the Scientific Committee of the 2nd European Conference on Computational Mechanics ECCM-2001, Cracow, 2001, continuous cooperation with the Institute of Fundamental Technological Research of the Polish Academy of Science, and Warsaw, Cracow and Silesian Universities of Technology.

Researchers and engineers on mechanics and computational methods regard Professor Zienkiewicz as one of the most outstanding scientists of the 20th century. He spoke beautiful and rich Polish and often emphasized his Polish roots. Professor's undisturbed activity after he had retired from University of Wales, Swansea in 1989 is worth mentioning. For instance, he chaired the UNESCO Chair of Numerical Methods in Engineering at University of Technology of Catalunya, Barcelona, Spain.

He was an honorary member of the Polish Association for Computational Mechanics (PACM). In recognition of his achievements PACM founded in 2007 Prof. O.C. Zienkiewicz Medal for outstanding Polish and foreign scientists who contributed significantly to the development of computational methods.

T. Burczyński
PACM President

E. Oñate
IACM President