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Ivan Hlaváček is seventy-five

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## IVAN HLAVÁČEK IS SEVENTY-FIVE\*

Without doubt Ivan Hlaváček is one of the top numerical analysts in the Czech Republic. He made several fundamental contributions to the theory of elastic and elasto-plastic bodies, the dual finite element method, to numerical solution of variational inequalities, optimal shape design, superconvergence of the finite element method, Galerkin approximation of nonlinear partial differential equations, the worst scenario method, and many other topics. Moreover, as he is still very active, new items may appear on his conto in the years ahead of us.



Ivan Hlaváček was born in the East Bohemian town of Náchod on March 27, 1933. From 1951 to 1956 he studied at the Faculty of Civil Engineering of the Czech Technical University in Prague. The advisor of his Ph.D. thesis was Prof. František Vyčichlo and later Prof. Karel Rektorys. After defending his thesis in 1960 he worked

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as Assistant Professor at the same faculty until 1963. Then he entered the Mathematical Institute of the Czechoslovak Academy of Sciences. He did research at the Department of Constructive Methods of Mathematical Analysis headed by Prof. Ivo Babuška, with whom he wrote a joint paper. During the school year 1965–66 he lectured at the University of Basra in Iraq, and he spent the period 1968–1969 as a UNESCO expert at the Regional Engineering College in Warangal (India). He received the scientific degree Doctor of Sciences in 1987.

In 1967 Ivan Hlaváček together with Prof. Jindřich Nečas initiated the seminar *Problems of Continuum Mechanics* at the Faculty of Mathematics and Physics of the Charles University in Prague. This seminar still exists and it has attracted many young scientists towards the area of variational problems, with a large number of high quality publications as a result. The paper [1], for instance, has by now several hundreds of citations.

In the early eighties, Ivan Hlaváček concentrated on a new mathematical topic, optimal shape design (see [2]). He solved problems concerning the existence of exact solutions of PDEs and their approximations obtained by the finite element method (see e.g. [3] and [4]).

In the eighties and nineties he was motivated by the work of Prof. Miloš Zlámal on superconvergence of the finite element method applied to elliptic boundary value problems (see, e.g., Appl. Math. 1987, 1996, 2001, and J. Comput. Math. 1996). Ivan Hlaváček contributed to the analysis of several superconvergence phenomena, in particular superconvergence that arises by averaging gradients of linear finite elements when solving general elliptic problems. These problems include, for instance, Lamé's equations of linear anisotropic elasticity, the model of the Cosserat continuum, and the standard Poisson equation with mixed nonhomogeneous boundary conditions. Later he worked on superconvergence on nonuniform meshes.

In the nineties I. Hlaváček wrote a serie of papers on finite element approximation of nonlinear elliptic problems that describe the temperature distribution in anisotropic and nonhomogeneous media. Here, the heat conductivity coefficient may depend nonlinearly on temperature. The corresponding weak formulation of such problems leads to nonlinear operators that are nonpotential and nonmonotone (see [5]). Therefore, standard solution methods from convex analysis cannot be applied. Together with coauthors Ivan Hlaváček proposed a new approach how to examine and numerically solve this kind of problems. In more recent years he also developed a very useful tool in numerical analysis called “the Worst Scenario Method” together with Jan Chleboun and Ivo Babuška (see [9]), and he started to work on numerical methods for financial mathematics.

Ivan Hlaváček's publication list is extensive. Both Zentralblatt and MathSciNet present around 150 of his papers. Almost 80 of those appeared in Applications of

Mathematics. He is coauthor of five monographs [6]–[10]. Some have been translated into several languages and published in prestigious publishing houses.

Ivan Hlaváček was the adviser of about ten Ph.D. students and he always had time to help his young colleagues. He has been a member of the Editorial Board of Applications of Mathematics for more than 35 years. He gave many invited lectures at international conferences. At the 1995 GAMM Conference (Gesellschaft für Angewandte Mathematik und Mechanik) he was awarded the Gold Bolzano Medal and in 2005 he received the Prize of the Czech Learned Society. In 2008, he got the Medal of the Czech Mathematical Society.

Ivan Hlaváček is an excellent, hardworking and modest scientist, our tutor and colleague, full of good humour, original ideas, and vitality. We are very lucky that we had the opportunity to work with him, and we hope that this will continue for many years to come. To his 75th birthday we wish him good health, success and happiness in his personal life, optimism and many more scientific results.

From June 25 to 28, 2008, the conference *Superconvergence Phenomena in the Finite Element Method* at the Institute of Mathematics of the Academy of Sciences of the Czech Republic took place. This was already the fourth international conference on this topic. The previous three were held at the University of Jyväskylä, Finland (1996), the Mathematical Sciences Research Institute at Berkeley, USA (2000), and at the Hunan Normal University in Chang-sha, China (2004). Due to the long-term activities of Ivan Hlaváček in this area, we are very pleased to dedicate to him both the Conference and this Special Issue of Applications of Mathematics.

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