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IVAN HLAVÁČEK PASSED AWAY

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Even in a sunny summer day, unexpected news can arrive, sadden the mathematical community, and catch out the Editorial Board of Applications of Mathematics. On July 22, 2018, an outstanding Czech applied mathematician and numerical analyst, Dr. Ivan Hlaváček, passed away in Prague after a short stay in hospital.

He was born in the East Bohemian town of Náchod on March 27, 1933. His interest in mathematics was evident since his childhood and was further stimulated by his father, a respected teacher of mathematics and later a headmaster of the state preparatory school in Náchod (*gymnasium* in Central European terms).

Ivan Hlaváček enrolled in the Faculty of Civil Engineering of the Czech Technical University in Prague in 1951, and completed his engineering degree there in 1956. He immediately began his doctoral studies under the supervision of František Vyčichlo and, after his supervisor passed away in his early fifties, of Karel Rektorys.

After defending his thesis in 1960, Ivan Hlaváček worked as Assistant Professor at the faculty till 1963. Then he joined the Mathematical Institute of the Czechoslovak Academy of Sciences, namely the Department of Constructive Methods of

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Mathematical Analysis headed by Ivo Babuška. During the school year 1965–66, Ivan Hlaváček 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).

Since the beginning of his scientific career, Ivan Hlaváček focused on the existence and uniqueness of solutions to various mathematical problems stemming from or related to linear and nonlinear differential equations originating in mechanics and engineering sciences. He quickly discovered the potential of variational principles in this area and significantly contributed to both theoretical foundations (let us recall Korn's type inequalities) as well as particular applications.

In 1967, he and Jindřich Nečas established the seminar on problems of continuum mechanics that has been regularly held since that year at the Faculty of Mathematics and Physics of Charles University in Prague, and bears Nečas's name now to honor the expert in partial differential equations.

Another output of this research period is the monograph [5] translated from the Czech edition.

Influenced mainly by French numerical analysts, he extended the existence analysis to discretized variationally formulated problems in the seventies, especially from the perspective of various variants (primal, mixed, dual) of the finite element method. Also, convergence analysis became a regular subject of his research.

These interests and interaction with his co-workers (predominantly with Jaroslav Haslinger) led him to pursuing research in two areas, namely variational inequalities and optimal shape design. The former resulted (apart from numerous scientific papers) in [4], a monograph published also in Slovak and Russian, and [2], an extensive chapter of a prestigious handbook. During three decades of the activity in the latter field, Ivan Hlaváček published almost forty papers on optimal design and optimal control; one third with Ján Lovíšek as a co-author.

Although already well-established in stochastic problems, broader and deeper aspects of uncertainty quantification caught the attention of engineers and analysts as late as in the nineties. Ivan Hlaváček immediately realized that the mathematical tools used to analyze and solve optimal design problems are directly applicable in worst-case approaches to problems with uncertain input data. By following a proven scheme rigorously interconnecting the existence of the worst-case scenario for a continuous problem and the existence of the worst-case scenario for a relevant approximation problem, he published the monograph [3] and twenty papers on uncertain data problems as the sole author or principal co-author.

The above list of Hlaváček's research activities is not exhaustive. Let us mention his fruitful collaboration with Michal Křížek resulting in more than a dozen papers on superconvergence phenomena and gradient recovery techniques (a few more details

in [1]), or his co-authorship of [6]. He also participated in solving industrial problems involving material strength or optimal cooling.

According to both Zentralblatt and MathSciNet bibliographical databases, the number of his publications totals to approximately 160. Nearly half of them appeared in Applications of Mathematics, the journal that owes him so much for his 35 years of service as an active member of Editorial Board and for even longer period as a willing and careful referee.

Ivan Hlaváček was the supervisor of about ten Ph.D. students. He was awarded the Gold Bolzano Medal (1995), the Prize of the Czech Learned Society (2005), the Medal of the Czech Mathematical Society (2008), and the Silver Medal of the Faculty of Mathematics and Physics of Charles University (2016).

His co-workers admired his ability to solve hard mathematical problems and to set up an entire scientific article in his mind. Indeed, he wrote a handwritten text hardly making any corrections to it or to the TEX output prepared by a secretary. His memory allowed him to recall formulae for differential operators in different coordinate systems or, at the age well over eighty, to recite poetry.

He did not compromise himself with the communist regime. Consequently, he experienced some difficulties. For instance, he received the highest Czechoslovak scientific degree, Doctor of Sciences, in 1987 after nine years of waiting for the fate of his doctoral thesis. In the late eighties, he took part in anti-regime protests. A video exists showing him falling on the ground after being hit by a policeman.

Ivan Hlaváček was an enthusiastic violinist, a respected member of academic orchestras and ad hoc ensembles organized on the occasion of scientific conferences or his visits to foreign universities.

He left behind a wife, daughter, and two grandchildren.

We will miss his profound erudition, expert advice, optimism, and gentle humor.

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