

Applications of Mathematics

Karel Segeth

Honorary Editor of Applications of Mathematics Ivo Babuška is eighty-five

Applications of Mathematics, Vol. 56 (2011), No. 2, 173–176

Persistent URL: <http://dml.cz/dmlcz/141436>

Terms of use:

© Institute of Mathematics AS CR, 2011

Institute of Mathematics of the Czech Academy of Sciences provides access to digitized documents strictly for personal use. Each copy of any part of this document must contain these *Terms of use*.



This document has been digitized, optimized for electronic delivery and stamped with digital signature within the project *DML-CZ: The Czech Digital Mathematics Library* <http://dml.cz>

HONORARY EDITOR OF APPLICATIONS OF MATHEMATICS
IVO BABUŠKA IS EIGHTY-FIVE

A lot of papers have been written on the occasion of Ivo Babuška's life jubilees and the pages of this Journal make no exception. The last celebrations of Ivo's significant life jubilee took place five years ago at several places in the world, including Prague. But Ivo's time incessantly runs at his famous working pace and we already have another opportunity to celebrate.

In the beginning, let us recall some biographical data. Ivo Babuška was born on March 22, 1926 in Prague in the family of architect Milan Babuška whose perhaps most known piece is the design of the National Technical Museum and the National Museum of Agriculture in Prague. Milan Babuška and his wife Marie are laid to rest in the family grave at the Vinohrady Cemetery in close vicinity of the Strašnice Crematory in Prague.

At present, Ivo Babuška lives in Austin, TX, where, though retired, he works at the University of Texas at Austin. He is married and has two children and four grandchildren who live in the States, too.

I will try to mention only his most significant life periods. More detailed data can be found in the papers from the bibliography added.

After the World War II, Ivo Babuška studied civil engineering at the Czech Technical University in Prague from where he graduated in 1949. In the same year he started his PhD study at the Center of Scientific and Technological Development. After the reorganization of Czechoslovak science and university education he joined the Mathematical Institute of the Czechoslovak Academy of Sciences in Prague.

The first period of Ivo Babuška's application work at the Mathematical Institute was devoted to the computational analysis of technology during the construction of Orlik Dam on the Vltava River in Bohemia (1953–1956). It required to assess mechanical stress in the dam caused by the heat produced during concrete hardening. All the computations were carried out by a team of people on mechanical desk calculators as Czechoslovakia was then in the "pre-computer period". An important byproduct of this project was a number of mathematical doctoral theses defended by his younger co-workers and, as a consequence, the origin of a generation of Czech numerical analysts.

An equally important application project, I already had the honor to take part in, was the mathematical modeling of relaxation of residual stresses in the course of the thermal treatment of thick-walled steel cylinders. Such a cylinder was then used as the outer shell of the first Czechoslovak nuclear reactor in the atomic power station in Jaslovské Bohunice.

By the end of August 1968, Ivo Babuška with his family departed for a one-year stay at the University of Maryland in College Park that had been arranged long before. Turn of political situation in Czechoslovakia after the August invasion of the Warsaw Pact armies and, in particular, the “normalization” of the political life after 1969 caused that Ivo Babuška has stayed in the United States till now.

A posteriori estimates of the error of numerical solution have been Babuška’s leading idea since the sixties of the 20th century. It was the period when the mathematical theory of the finite element method was only in its beginning. Ivo and his colleagues thus experimented with the finite difference method in the way called now the postprocessing of the approximate solution.

My wife Jitka, also a numerical analyst, and I spent the academic year 1969–1970 at the University of Maryland thanks to the invitation Ivo Babuška initiated. It was a year of a very close and stimulating cooperation with Ivo, in particular in the realization of computational tests carried out by the finite element method and in the solution of connected problems. We discussed research matters every day and Ivo advised us intensively in our work. We saw quite a lot of all Ivo’s family, his mother Marie, wife Renata, and their two children, Lenka and Vít. They were then little kids and we sometimes even took care of them.

Ivo Babuška was then interested in the theory and practice of the finite element method and his interest continues till now but at the University of Texas at Austin since 1995. The website genealogy.math.uni-bielefeld.de/genealogy claims that he has had 36 doctoral students up to now. A lot of them have become world-famous. In the approximate time sequence they were Jindřich Nečas (1956), Emil Vitásek, Jaroslav Kautský, Jaroslav Fuka, Ivan Hlaváček, Jiří Taufer, and Karel Segeth at the Mathematical Institute of the Czechoslovak Academy of Sciences, Stephen Leventhal (1973), John Lavery, Michael Vogelius, Anthony Miller, Michael Bieterman, William Szymczak, Richard Morgan, Milo Dorr, Václav Majer, Soeren Jensen, Benqui Guo, Soeren Larsen, Eric Bonnetier, Panagiotis Papadakis, Christoph Schwab, Jens Hugger, In-Ja Lee, Takuya Tsuchiya, Weimin Han, Zhimin Zhang, Yiwei Li, Kang-Man Liu, Aaron Naiman, Revathi Narasimhan, Jens Melenk, Felix Santos, Joseph Shirron, and Thomas Stone at the University of Maryland at College Park, and Per-Gunnar Martinsson (2002) at the University of Texas at Austin.

Let us recall at least several important Ivo’s acts that influenced Czech as well as world numerical analysis. He established this Journal, *Applications of Mathematics*,

in the Mathematical Institute of the Czechoslovak Academy of Sciences in 1956. Together with professor Kurzweil he organized the first of Czechoslovak EQUADIFF conferences in Prague in 1962. These conferences take place till now alternately in Prague, Bratislava, and Brno with the period of 4 years. Recently, they have merged with the series of conferences of the same name organized at different places in Western Europe with the same period (but with 2 year phase shift).

Ivo organized international scientific conferences Basic Problems of Numerical Analysis in Liblice near Prague in 1964 and 1967. Top mathematicians of that time from Europe, the United States, and the Soviet Union took part in these conferences. (Try to imagine organizing an international conference without Internet!) Two more conferences of the same name took place after 1968 in Czechoslovakia, in Prague in 1974 and in Pilsen in 1978.

In the last few years, Ivo Babuška's scientific interest has concentrated on the influence of uncertainty of data on the results of solving the problem and, moreover, it has focused on questions of validation and verification. Recently he with his co-authors have completed two monographs on the finite element method that are meant for the general, in particular technical, public [12], [13]. The former discusses the mathematical theory of the method, and its relation to engineering applications and reliability of computation while the latter is devoted to mathematical modeling. Its principles are illustrated with the help of commercial software StressCheck in whose development Ivo also participated.

The aim of this contribution is not to describe in detail all Ivo Babuška has achieved in his fruitful life. We have not mentioned five honorary doctorates awarded at notable world universities, medals obtained, etc. Let us list at least some appreciations directly connected with the Czech Republic: Czechoslovak State Prize (1968), Professor at Charles University in Prague (1968), Honorary Member of the Union of Czech Mathematicians and Physicists (1996), Bernard Bolzano Honorary Medal of the Academy of Sciences of the Czech Republic (1997), Honorary Doctor of Science at the Charles University in Prague (1997), Honorary Foreign Member of the Czech Learned Society (1998), Honorary Doctor of Science at the Czech Technical University in Prague (2006), and Honorary Medal De scientia et humanitate optime meritis, the highest award granted by the Academy of Sciences of the Czech Republic (2006). Asteroid 36060 has been named Babuška (2003).

Ivo Babuška founded Prize for young Czech research scientists in the field of numerical mathematics and computational mechanics in 1994. The prize funded by his own means was awarded for the seventeenth time in 2010.

The Institute of Mathematics of the Academy of Sciences of the Czech Republic remembered Ivo Babuška's 85th birthday at the seminar Current Problems in Numerical Analysis on March 18, 2011 by presentation of the recording of his lecture

Courant Element: Before and After at a conference held in Jyväskylä (Finland) in 1993.

The complete list of Ivo Babuška's publications till 2004 can be found on his website users.ices.utexas.edu/~babuska/. His further publications can be looked up in MathSciNet. The list of all his papers till 1996 appeared also in [2]. Web of Science records 257 of his publications and states that his h-index is 58. Moreover, Publish or Perish database lists more than 1,000 Babuška's papers and books and h-index equal to 70. ISI Web of Knowledge presents Ivo in the category Highly Cited Researcher on the website ISIHighlyCited.com. His biographical data and the list of his 346 publications are given there. Ivo's production of scientific results has not declined recently: MathSciNet shows 27 of his scientific works published between 2006 and 2011.

It was impossible to present Ivo Babuška's fruitful life completely and include all the important data that should be at least mentioned. Let us wish him many further years of good health, family happiness, and yet more excellent mathematical results.

References

- [1] *K. Segeth*: Professor Ivo Babuška is seventy. *Appl. Math.* 41 (1996), 231–232.
- [2] *K. Segeth*: Professor Ivo Babuška is seventy. *Czechoslovak Math. J.* 46 (1996), 351–367.
- [3] *K. Segeth, E. Vitásek*: Mathematical Institute of the Academy of Sciences is fifty. *Pokroky Mat. Fyz. Astronom.* 48 (2003), 31–40. (In Czech.)
- [4] *K. Segeth, P. Krejčí*: Applied mathematics during the 50 years history of the Mathematical Institute of the Academy of Sciences. *Appl. Math.* 48 (2003), 1–2.
- [5] *J. Chleboun, I. Hlaváček*: To the seventieth birthday of Professor Ivo Babuška. *Pokroky Mat. Fyz. Astronom.* 51 (2006), 71–73. (In Czech.)
- [6] *K. Segeth*: Professor Ivo Babuška is eighty. *Appl. Math.* 51 (2006), 89–92.
- [7] *K. Segeth*: Eightieth birthday of Professor Ivo Babuška. *Bulletin České společnosti pro mechaniku*, No 2 (2006), 21–23. (In Czech.)
- [8] *K. Segeth*: Will you sign the blueprint? *Akademický bulletin*, No 9, 15 (2006). (In Czech.)
- [9] *J. Chleboun, T. Vejchodský*: Programs and Algorithms of Numerical Mathematics 13 in honor of Ivo Babuška's 80th birthday. *Appl. Math.* 52 (2007), 185–186.
- [10] *K. Segeth*: 2006 Congress Medalist Ivo Babuška. *IACM Expressions* No. 21, June 2007, 39–39.
- [11] *L. Demkowicz, B. Guo, J. Osborn, M. Vogelius*: Ivo Babuška—mathematician and engineer. *Comput. Methods Appl. Mech. Engrg.* No. 37–40, iii–v, 196 (2007).
- [12] *I. Babuška, J. Whiteman, T. Strouboulis*: *Finite Elements. An Introduction to the Method and Error Estimation.* Oxford University Press, Oxford, 2011.
- [13] *B. Szabó, I. Babuška*: *Introduction to Finite Element Analysis: Formulation, Verification and Validation.* John Wiley & Sons, 2011.

Karel Segeth