K. Segeth
Preface

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Conference Applications of Mathematics 2015, in honor of the birthday anniversaries of Ivo Babuška (90), Milan Práger (85), and Emil Vitásek (85)
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PREFACE

"Will you sign the blueprint?" is the favorite question of Professor Ivo Babuška, the question well known among the participants of many conferences and seminars. This question expresses the philosophy of Ivo Babuška's professional life. His experience tells him that it is not enough to model real processes on a computer but that it is extremely important to assess the quality of the result obtained. Only then you can sign the blueprint. Unfortunately, there are examples of blueprints signed without care of the reliability of the results, blueprints that caused fatal failures and huge damage in practice.

Ivo Babuška

Ivo Babuška, a mathematician recognized all over the world, was born on March 22, 1926 in Praha (Prague). One of the aims of the conference Applications of Mathematics 2015, organized by the Institute of Mathematics of the Czech Academy of Sciences, was to remember all the achievements Ivo Babuška has realized so far. We appreciate not only his theoretical results in the finite element method and in computational mathematics in general, but also his role of mentor of several dozens of PhD students and his position of a wise man who can predict the future of computational mathematics, present his visions to his colleagues, and successfully lead them to progress in this field.

Many papers have already been written about the life and work of Ivo Babuška. He is still very active in mathematics and publishes new results. Although his curriculum vitae has been published in various journals and proceedings many times, let me provide you with at least some principal biographical data and some of Babuška's outstanding mathematical results. More information can be found on the site `users.ices.utexas.edu/~babuska/` or in biographical papers.

Ivo Babuška studied civil engineering at the Czech Technical University in Prague, received his MS (Ing.) degree in 1949 and the PhD degree in Technical Science (Dr. tech.) in 1951. Then he studied mathematics at the Central Mathematical Institute in Prague as a graduate student of Professor V. Knichal. From 1951 he was a research fellow at the Institute. The Institute changed its name to the Mathematical Institute of the Czechoslovak Academy of Sciences in 1953 (now the Institute of Mathematics of the Czech Academy of Sciences).

In 1955 Ivo Babuška received the PhD (CSc.) degree in Mathematics and in 1960 the D.Sc. (DrSc.) degree which was in Czechoslovakia (as well as is now in the Czech Republic) awarded for the highest scientific achievements. From 1955 to 1968 he was the Head of Department of Constructive Methods of Mathematical Analysis of the Mathematical Institute. It was my privilege to work on my MS thesis at this Department during my studies at Charles University in Prague and to become a member of the Department in 1964. Later I also became Ivo Babuška's graduate student.

All Ivo Babuška's biographies mention his first important computational achievement in 1953–1956 when he was the leader of a numerical group that analyzed the technology of constructing the 91 meter high gravitational Orlík Dam on the Vltava River in Bohemia. The mathematical problem was to solve a nonlinear partial differential equation. Let me stress that all the computations were carried out by a team of people on mechanical desk calculators since no better devices were available in Czechoslovakia that time. The mathematical and numerical problems treated in the project provided many fruitful topics for investigation and initiated the research in a general theory of numerical stability of algorithms.

Ivo Babuška is the Honorary Editor of the journal Applications of Mathematics (formerly Aplikace matematiky) that he established in Prague in 1956. He was one of the founders of the EQUADIFF international scientific meetings that are still taking place. The first international EQUADIFF Conference on Differential

Equations was held in Prague in 1962. Later this series of conferences merged with another European series bearing the same name.

Ivo Babuška was appointed professor at Charles University in Prague in 1968. The same year he arrived in the United States and became a professor at the Institute for Physical Science and Technology and the Department of Mathematics of the University of Maryland at College Park. His interest in applied and numerical analysis brought him to the finite element method. He has achieved numerous bright results in the method itself, in its *hp*-version, in its reliability, a priori and a posteriori estimations, and adaptive approaches. These are recognized all over the world and belong to the fundamentals of the method. Moreover, Ivo Babuška has accomplished excellent results in several other branches of computational mathematics.

Ivo Babuška belongs among the founders of the Finite Element Circus, an informal meeting which, for more than 40 years, takes place twice a year.

From 1989, when the political situation in Czechoslovakia changed, he could resume visiting Prague. In 1994, he established the Prize for Young Czech Scientists in the field of numerical analysis and computational mechanics that is funded by his own means and awarded annually.

In 1995, Ivo Babuška became a senior research scientist and Robert Trull Professor at the Institute for Computational Engineering and Sciences at the University of Texas at Austin.

Along with his other activities, he has been involved in mentoring several dozens of graduate students, see `genealogy.math.uni-bielefeld.de/genealogy`. He is a member of editorial boards of numerous mathematical and engineering journals.

Ivo Babuška has received recognition and various awards for his scientific work. A brief supplement to the long list of his honors obtained before 2005 includes the following: Member of the U.S. National Academy of Engineering (2005), Member of the Academy of Medicine, Engineering, and Science of Texas (2005), Honorary Diploma of the Czech Society of Mechanics (2005), Honorary Medal De scientia et humanitate optime meritis, the highest award provided by the Czech Academy of Sciences (2006), Congress Medal of the 7th World Congress of Computational Mechanics in Los Angeles, International Association for Computational Mechanics (2006), Honorary Doctor of Science at the Czech Technical University in Prague (2007), Leroy P. Steele Prize for Lifetime Achievement, American Mathematical Society (2012), Neuron Award for Contribution to Science, Neuron Fund, Prague (2014).

Ivo Babuška's name is inseparably connected with the development of the finite element method. His theoretical results are widely used, directly or indirectly, in engineering practice. He has been invited for numerous lectures at conferences all over the world. The list of Ivo Babuška's monographs and papers in the Mathematical Reviews contains more than 300 items.

We must not omit a particular source of Ivo Babuška's scientific success, the family background provided by his wife Renata. They have a daughter and a son and four grandchildren.

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To commemorate the significant life jubilees of Ivo Babuška, Milan Práger, and Emil Vitásek, the Institute of Mathematics of the Czech Academy of Sciences organized the International Conference *Applications of Mathematics 2015* on the premises of the Institute in Žitná 25, Prague 1 from November 18 to 21, 2015 (see website `am2015.math.cas.cz`).

The Scientific Committee consisted of

Mark Ainsworth (Brown University, Providence, RI, U.S.A.)

Jan Brandts (University of Amsterdam, the Netherlands)

Jan Chleboun (Czech Technical University, Prague, Czech Republic)

Miloslav Feistauer (Charles University, Prague, Czech Republic)

Jaroslav Haslinger (Charles University, Prague, Czech Republic)

Sergey Korotov (Basque Center for Applied Mathematics, Bilbao, Spain)

Qun Lin (Academy of Mathematics and System Science, Beijing, China)

Hans-Goerg Roos (Technical University, Dresden, Germany)

Theofanis Strouboulis (Texas A&M University, College Station, TX, U.S.A.)

Martin Stynes (National University of Ireland, Cork, Ireland)

Takuya Tsuchiya (Ehime University, Matsuyama, Japan)

Shuhua Zhang (Tianjin University of Finance and Economics, China)

Zhiming Zhang (Wayne State University, Detroit, MI, U.S.A.)

The Local Organizing Committee (Academy of Sciences) consisted of
Hana Bílková
Michal Křížek
Karel Segeth (Chair)
Jakub Šístek
Tomáš Vejchodský

The Organizing Committee is grateful to all authors for their contributions, to Project RVO 67985840 (Institute of Mathematics, Czech Academy of Sciences), and to Grant MTM2011-24766 (MICINN, Spain).

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Ivo Babuška, Milan Práger, and Emil Vitásek deserve our congratulations and our sincere wishes of good health, optimistic mind, family happiness, and yet more scientific achievements.

Karel Segeth, on behalf of the Organizing Committee