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DOI

[10.1007/s10492-013-0006-6](https://doi.org/10.1007/s10492-013-0006-6)

Publication date

2013

Document Version

Final published version

Published in

Applications of Mathematics

[Link to publication](#)

Citation for published version (APA):

Brandts, J., & Křížek, M. (2013). Seven decades of professor Karel Segeth. *Applications of Mathematics*, 58(2), 125-128. <https://doi.org/10.1007/s10492-013-0006-6>

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SEVEN DECADES OF PROFESSOR KAREL SEGETH

JAN BRANDTS, Amsterdam, MICHAL KRÍŽEK, Praha

Karel Segeth was born on May 10, 1943 in Prague. His father taught biology and geography in secondary school and his mother was a pediatrician. While in elementary and secondary school Karel regularly took part in the Mathematical Olympiad and got several diplomas. In 1964, he finished his studies at the Faculty of Mathematics and Physics of Charles University in Prague and started to work as research assistant at the Mathematical Institute of the Czechoslovak Academy of Sciences.



He spent three months of 1966 in academical institutions in Novosibirsk, Moscow, and Kiev. During the period 1969–1970 he worked at the University of Maryland in College Park, where he developed numerical software for Prof. Ivo Babuška. In 1969 he received the academic title RNDr. from the Faculty of Mathematics and Physics of Charles University and three years later he defended his doctoral thesis *On universally optimal quadrature formulae involving values of derivatives of integrand* at the Mathematical Institute of the Academy and got the scientific degree

Candidate of Sciences (equivalent to PhD). His advisor was Ivo Babuška. In 1996 Karel Segeth passed his habilitation at the Faculty of Mathematics and Physics of Charles University and received the title Doc. (equivalent to Associate Professor). In 2004 he became Full Professor in Applied Mathematics at the University of West Bohemia in Pilsen.

The scientific activities of Prof. Segeth are very broad. Among computational methods for numerical solution of partial differential equations, he deals with problems in geophysics, archaeology, and also in medicine (e.g. diffusion in layered structures of the human brain). No wonder that he publishes his results in an extensive spectrum of scientific journals, such as *Numerische Mathematik* (see [4]), *Geophysics*, *Applications of Mathematics*, *Biophysical Journal*, *Czechoslovak Mathematical Journal*, *Tectonophysics*, *International Journal for Numerical Methods in Fluids*, *Computers & Geosciences*, and *Mathematics and Computers in Simulation*.

The main research interest of Prof. Segeth is the solution of problems of mathematical physics and numerical modeling of physical phenomena (e.g. semiconductor devices, electric and magnetic fields). At present, Prof. Segeth examines mainly *a posteriori* bounds for the discretization error in numerical solutions of differential equations. Their analytical solution in explicit form is usually not known. Therefore, some approximate methods need to be used. Once the approximate solution is computed, the discretization error can be estimated *a posteriori* by means of sophisticated mathematical methods. Prof. Segeth focuses on the finite element and finite volume methods for numerical solution of boundary value problems for partial differential equations of elliptic type and also the method of lines for solving initial-boundary value problems for nonlinear evolution equations of parabolic type. This has a close connection to his interest in numerical solution of large systems of algebraic equations by the methods of cyclic reduction and conjugate gradients, fast Fourier transform, the multigrid method, etc. Prof. Segeth showed the practical importance of *a posteriori* error estimates of the discretization error, which can be effectively used in the finite element method for adaptive mesh refinements.

Further areas of interest of Prof. Segeth are mathematical methods for solving real-life problems in geophysics and archaeology. At present he deals with numerical simulation of solid particles in slowly flowing viscous liquids. For many years he cooperated with Professor Irwin Scollar from the *Laboratorium für Feldarcheologie*, *Rheinisches Landesmuseum* in Bonn. By means of the Fourier analysis of aerial photographs or terrain data (gravitational or electromagnetic) they developed methods for discovering new archaeological deposits and mineral resources. The Fourier transform is also at the basis of one of his other favourite topics, namely the implementation of so-called fast algorithms. He has been contributing to the journal *Applications of Mathematics* for many years (altogether sixteen articles up

to present, see e.g. [3]). He also published many articles in *Pokroky matematiky, fyziky a astronomie* and prepared several interesting translations.

He wrote his first monograph [1] together with Václav Bezvoda. Segeth's rich experience with the method of lines and numerical algebra are included in another monograph [5] of 400 pages (coauthors P. Šolín and I. Doležel), which has got many citations. He also contributed to Rektorys' *Survey of Applicable Mathematics*, Prometheus, Prague 1995, whose English version appeared in the prestigious publishing house Kluwer in 1994. Prof. Segeth is coeditor of 16 conference proceedings *Programs and Algorithms of Numerical Mathematics*, that he coorganizes with his colleagues from the Institute of Mathematics. His excellent knowledge of languages helped him to translate several important monographs on numerical linear algebra and continuum mechanics. Together with Petr Příklad he translated the monograph by Jindřich Nečas and Ivan Hlaváček from Czech into English, as well as a book by Miroslav Fiedler. They also translated the famous treatise of A. A. Samarskij and J. S. Nikolajev from Russian into Czech, and another monograph by G. I. Marchuk.

Prof. Segeth has a rich pedagogical experience due to the many decades that he worked at several Czech universities, such as the Faculty of Mathematics and Physics and Faculty of Sciences of Charles University in Prague, Faculty of Mechanical Engineering of Czech Technical University in Prague, Faculty of Applied Sciences of the University of West Bohemia in Pilsen and Technical University at Liberec. He lectured numerical methods for solving large sparse systems, numerical software, programming in FORTRAN, numerical modeling of problems in electrical engineering, but also basic courses in mathematics. He is the author or coauthor of eight lecture notes. He was advisor of ten diploma students and of PhD students M. Pospíšek, P. Vaněk, V. V. Vlček, and M. Zítka. He was invited to give lectures at several world-wide known universities: Wayne State University in Detroit, the University of Texas at Austin, A & M University of Texas, the University of Maryland, the State University of New York, Keio University of Yokohama, Flinders University in Adelaide as well as at many European universities.

Due to his brilliant organization capabilities he was the Secretary of the Scientific Collegium for Mathematics of the Czechoslovak Academy of Sciences from 1982 to 1992, which was headed at that time by Prof. Miloš Zlámal. In 1994 Karel Segeth succeeded Dr. Milan Práger as the Head of the Department of Constructive Methods of Mathematical Analysis of the Mathematical Institute, and at the same time he was elected as the Head of the Scientific Council of the Mathematical Institute. After that he was the Director of the Mathematical Institute for two periods (1996–2000 and 2000–2004). From 2004 to 2009 he was the Head of the Department of Mathematics and Didactics of Mathematics of the Technical University at Liberec. During the period 2004–2008 he also headed the Department of Applied Mathematics

there. He was a member of five scientific councils of university faculties at Prague, Olomouc, Liberec, and Pilsen. At present he is still a member of the Scientific Council of the University of West Bohemia in Pilsen. Together with the Union of Czech Mathematicians and Physicists and the Czech Society for Mechanics, and with great enthusiasm, he has started to organize the *Babuška Prize* for the best student work in the field of Computer Science in 1994.

Since 1996 Prof. Segeth is a member of the Union of Czech Mathematicians and Physicists. In 2003 and 2004 he received two memorial medals from the Faculty of Mathematics and Physics of Charles University. He became the Deserving Member of the Union of Czech Mathematicians and Physicists in 2006.

To commemorate the 70th birthday of Prof. Karel Segeth we organized the International Conference *Applications of Mathematics 2013* at the Institute of Mathematics in Žitná 25, Prague 1, from 15 to 17 May 2013 (see www.math.cas.cz/~am2013).

Karel Segeth is married with Dr. Jitka Segethová, a granddaughter of mathematician Prof. Josef Holubář (see [2]). She taught mostly numerical methods at the Faculty of Mathematics and Physics of Charles University in Prague. Karel and Jitka have two daughters, Jitka and Jana, and two grandchildren. We wish Prof. Karel Segeth and his family enduring happiness and good health.

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