Ludwig Elsner and his contributions to core, applied and numerical linear algebra

Angelika Bunse-Gerstner a, Volker Mehrmann b,*

a Fachbereich Mathematik und Informatik, Universität Bremen, D-28334 Bremen, Germany
b Fakultät für Mathematik, TU Chemnitz, D-09107 Chemnitz, Germany

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1. Biography of Ludwig Elsner

Ludwig Elsner was born on 17 January 1939 in Groß-Strehlitz, Upper Silesia in Germany. He studied mathematics, physics and astronomy at the universities of Hamburg and Freiburg and received his diploma in mathematics in 1963 at the University of Hamburg. As a member of the lively and inspiring group of Lothar Collatz in Hamburg he worked on his Ph.D., while holding a position at the computing center of the University of Hamburg. He received his Ph.D. in 1965 and became an Assistant Professor at Collatz’ Institute of Applied Mathematics at the University of Hamburg for six years. During this period he spent one year, 1968–1969, as senior officer at the CSIR in Pretoria, South Africa. In 1971 Ludwig Elsner became Associate Professor at the University of Erlangen, where he worked at the Institute for Applied Mathematics until 1976. Since 1976 he has been a Full Professor at the University of Bielefeld where he has built up the Numerical Analysis group. Among many other activities in Bielefeld, he has twice been Chairman of the Department of Mathematics and has planned and formed the numerical analysis group of the “Sonderforschungsbereich Diskrete Strukturen in der Mathematik”, which since 1989 has attracted many specialists in linear algebra and numerical linear algebra to work with Elsner in Bielefeld. Numerous publications prove the success of these collaborative efforts.

* Corresponding author. E-mail: mehrmann@mathematik.tu-chemnitz.de

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Beginning with 1974 there have been several sabbaticals that Ludwig Elsner spent as visiting professor at the University of Calgary in Alberta. For shorter periods he has worked at the Indian Statistical Institute in New Delhi in 1989 and 1993. He has had extended visits at the Chinese Academy of Science and the University of Victoria in Canada. These research visits lead to much fruitful research collaboration with several colleagues from all over there world.

2. Research work of Ludwig Elsner

Ludwig Elsner’s research work is probably best characterized by placing it in the middle of the union of core, applied and numerical linear algebra, and it includes some excursions into control theory, numerical integration, operator theory, and other areas of mathematics.

During the first part of his academic career he worked mainly on the solution of eigenvalue problems, including eigenvalue inclusions and Gershgorin type results. He then turned to the analysis of nonnegative and M-matrices as well as the numerical computation of spectral radii, their perturbation theory and related problems.

Since the early eighties his research has covered almost the whole spectrum of core, applied and numerical linear algebra. We wish to stress his contributions to perturbation theory for matrix pencils, spectral variation, scaling problems in the solution of linear systems, distance problems (for instance his investigation of the distance to nonnormality or uncontrollability), the numerical solution of eigenvalue problems with or without structure using classical and flow methods including the analysis of these methods, parallel iterative methods, chaotic or asynchronous methods for the solution of linear systems, algebraic multigrid methods, variation results for permanents, completion problems for Hermitian and nonhermitian matrices, convergence results for infinite products, determinant bounds, and many other areas. More detail could be added by inspecting his list of publications. Many of the results discussed are joint cooperative work with a large number of coauthors.

The above remarks indicate the great breadth of Ludwig Elsner’s research work and his great fundamental knowledge in many areas of mathematics.

3. Ph.D. students of Ludwig Elsner

Ludwig Elsner has been advisor of 13 Ph.D. students in many different research areas, see the list below. He is always an inspiring partner for discussions and gives strong support to his students; in particular he has been a rich source for counter-examples to interesting but wrong conjectures by his students.


4. Publications of Ludwig Elsner

68. Perturbation and Interlace Theorems for the Unitary Eigenvalue Problem (with Chunyang He), Linear Algebra Appl. 188/189, 207–229 (1993).
72. Completion of a Matrix so that the Inverse has Minimum Norm. Application to the Regularization of Descriptor Control Problems (with Chunyang He and Volker Mehrmann), IMA Volumes in Mathematics and its Applications 62, 75–86 (1994).
74. Minimizing the Condition Number of a Positive Definite Matrix by Completion (with Chunyang He and Volker Mehrmann), Numerische Mathematik 69, 17–23 (1994).
79. Minimization of the Norm, the Norm of the Inverse and the Condition Number of a Matrix by Completion (with Chunyang He and Volker Mehrmann), Numerical Linear Algebra with Applications 2, no.2, 155–171 (1995).
90. Distance Between Commuting Tuples of Normal Matrices, to appear in Archiv der Mathematik (with Rajendra Bhatia and Peter Semrl).
91. On a Polygon Inequality Problem by Bernius and Blanchard (with Lixing Han, Israel Koltracht, Michael Neumann and Mori Zippin), to appear in Journal of Mathematical Analysis and Applications.