

Helmut Wielandt and his Mathematical Diaries: Unpublished Work in Group Theory, Matrix Theory and Numerical Analysis

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When the well-known German mathematician Helmut Wielandt passed away in 2001, his family donated his 19 mathematical diaries to the mathematics community to explore unpublished results and open problems.

Helmut Wielandt was a student of Schur who worked in algebra, group theory, on numerical methods for eigenvalue problems, matrix computations, perturbation theory and many other areas of mathematics. Some of his contributions now form part of the fundamentals of mathematics covered by undergraduate and graduate textbooks.

This talk is accessible to mathematics faculty and graduate students in every field. It has 3 parts:

- First we give a historical survey: discussing Helmut Wielandt's life and in particular the time from 1934 to 1950.
- The second part will discuss his mathematical diaries and the project funded by German Science foundation to make this work available to the public.
- The third part will discuss the mathematics of one page of his diaries, where Wielandt suggests some sill open problems concerning quasi-commutativity for matrices. We present Theorems of Drazin, Potter and Schützenberger and discuss some solutions to other open problems. In particular, we determine all polynomial identities for quasi-commutative matrices and show that the classification problem for quasi-commutative matrices is equivalent to that for commuting matrices. Finally we discuss the converse of Potter's theorem.

References:

- [1] O. Holtz, V. Mehrmann and H. Schneider. Potter, Wielandt, and Drazin on the matrix equation " $AB = xBA$ ": Some new answers to old questions. *American Mathematical Monthly*, Vol. 111, 655–667, 2004.
- [2] V. Mehrmann and H. Schneider, "Anpassen oder nicht? Die Geschichte eines Mathematikers im Deutschland der Jahre 1933-1950." ("Conform or not? The history of a mathematician in Germany in the years 1933-1950") *Mitteilungen der Deutschen Mathematiker Vereinigung*, No. 2, 20–26, 2002.