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# Helmut Wielandt 19 December 1910–14 February 2001 A personal memoir

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**Abstract**

We present two well-known mathematicians' views on Wielandt written in 1964, some prescient remarks by Wielandt summing up his attitude to mathematics, and some thoughts on his mathematical power.


When a major mathematician dies, it is customary to sum up and evaluate his work. I cannot do better than to quote from letters addressed to me in February 1964 by two very famous algebraists:

> "The major part of [Wielandt's] work has been in the theory of finite groups, which is now once more undergoing a rapid development, after a period of abeyance. To this development, Wielandt has been a dominant contributor, partly by the introduction of new ideas which have proved fertile, but chiefly I think by his penetrating insight into the difficulties of the subject, combined with astonishing technical skill in overcoming them. In this field he is the natural successor of Georg Frobenius and Issai Schur; and he is at least their equal. Indeed, in some respects, he is their superior, most notably in the air of easy elegance which he imparts to everything he writes. This mastery of style is something much deeper

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than surface polish; and his early papers remain today as classical statements, largely immune from the hand of the improver."

"Compared to his giant size in the theory of groups, I am a pigmy."

The first is from a letter of Philip Hall and the second short quote was received from Bernhard Neumann[1] (some pigmy!).

Wielandt had held the prestigious Carl Schurz Professorship at the University of Wisconsin in 1963 and a year later our department made him a tenure offer. I was put in charge of collecting letters of reference and the quotations above are from letters that I have held confidential in my files for 37 years.

Wielandt did indeed return to our University after a year's absence, stayed for two years and then returned to Tuebingen. In these two years, together with other faculty members and graduate students, I had the privilege of attending his lectures which resulted in his well-known lecture notes "Analytic Matrix Theory". To explain his mathematical power, I would sometimes remark "Tell Helmut a theorem you have worked hard to prove. If it takes him more than 30 seconds to produce a proof, it is publishable".

Wielandt's huge fame rests in large part on his contributions to group theory but it must not be forgotten that in somewhat more than 20 papers he deeply influenced theoretical and numerical linear algebra. One may ask why he was interested in these areas which were then much less respected in an era when much of the emphasis in mathematics was on abstraction. An answer is found in his view of mathematics (possibly influenced by his teacher, Issai Schur) which he expounded in his inaugural address [1] to the Heidelberger Akademie der Wissenschaften in the early 1960's:

"...it is perhaps appropriate to say a few words to place my work into its general context. The main line of development of mathematics has been characterized for several decades by the invasion of the axiomatic method into ever more areas. The goal is to derive all of mathematics deductively from just a few basic principles such as order and continuity. By turning increasingly towards the abstract, revolutionary unification has been achieved in mathematics, which must, by the way, gradually reach out also into school mathematics. It is as if some areas of mathematics which earlier could hardly be reached on foot are now connected by motorways. My own work has contributed nothing to these significant developments, except perhaps the recently undertaken attempt to free the theory of permutation groups from its restriction to finite groups. In fact, the impetus which Göttingen had given to abstract algebra reached Berlin just when I was a student, and recognition of the implications of the axiomatic method fascinated me just as it did my fellow students. But I could not share the general opinion that this would henceforth be the only rewarding direction for research. It seemed to me that, like all great deductive systems, it was threatened by the

[1] Prof. Neumann has graciously given permission to quote his letter.

danger that the problems which it could not properly accommodate would be dismissed as uninteresting, whereas on the contrary, these ought to provide a stimulus to broaden the foundations. The development of the theory of finite groups has shown, I think, that this point of view was not wholly unjustified. The circle of questions in all its detail proved to be hardly accessible by the extensive apparatus that had been developed for the axiomatic method, and it failed to retain the interest of group-theorists, most of whom turned to infinite groups, in particular to continuous groups. It has, however, been revived by Hall and others using classical methods and posing classical questions, and the theory of finite groups, if isolated, has nevertheless undergone an almost dramatic development in recent years. In terms of the metaphor I used earlier, this research area seems to me to be a mountainous region that is still undisturbed by roads and has to be traversed on foot. But this has its charm. And the nice surprises that one experiences compensate for the occasional compassionate glances of motorists. This has been an admittedly only subjective justification of the direction of my work. But it is unmistakable that questions about finite structures are again coming strongly to the fore also in other areas of mathematics, partly as a result of growing applications of computing machines. I am convinced that the "finite" direction will be reunited with the mainstream in the course of the next few decades."

Wielandt's remarks forecast and help to explain in a remarkable way the resurgence of fields, such as combinatorics and linear algebra, which are as closely tied to their nineteenth century ancestors as they are to twentieth century abstract mathematics, though the extent to which unification has taken place may be questioned. Wielandt contributed greatly to these developments and those of us who work in linear algebra owe him a debt of gratitude.

I shall conclude this personal tribute to a great mathematician with another personal note. Wielandt's best known paper in matrix theory [2] revitalized the area of nonnegative matrices and generalizations. It appeared in November 1950 which, as it happens, is also the month when I started research in this area. His paper was one of the first I read and it influenced me deeply. I sometimes think I was born as a mathematician under Wielandt's star. It would be hard to cast a better mathematical horoscope.

## References

[1] Helmut Wielandt, Antrittsrede (Inaugural address), Sitzungsber. Heidelb. Akad. Wiss., 1961/62 (1663), 55–57 (pp. X–XV in [3]).

[2] Helmut Wielandt, Unzerlegbare, nicht negative Matrizen, Math. Z. 52 (1950), 642–648 (pp. 100–106 in [3]).

[3] Helmut Wielandt, in: B. Huppert, H. Schneider (Eds.), Mathematische Werke/Mathematical Works, vol. 2, de Gruyter, Berlin.