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Linear Algebra and its Applications 280 (1998) 1-3

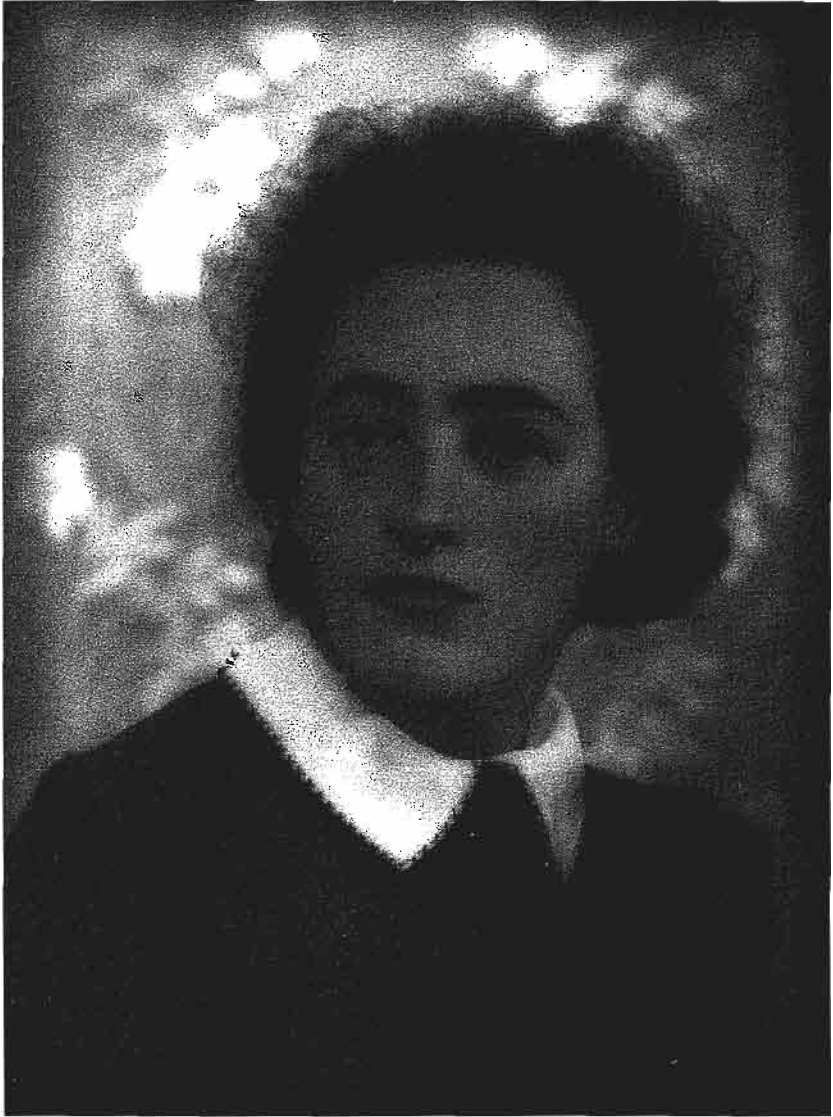
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LINEAR ALGEBRA
AND ITS
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Preface

This volume of Linear Algebra and its Applications honors Olga Taussky Todd, one of the founders of the journal. We wish to express our appreciation to Friedrich Bauer, Alan Hoffman, Charles R. Johnson and Helene Shapiro for their contributions. Our special thanks are due Helene Shapiro who has also edited this volume with great skill.

Richard A. Brualdi
Hans Schneider



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Linear Algebra and its Applications 280 (1998) 15–19

135

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Some personal reminiscences of Olga Taussky-Todd

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Received 23 November 1997; accepted 26 January 1998

Submitted by H. Shapiro

The year was probably 1953 and I was living in Belfast. One day our doorbell rang and there stood Olga Taussky and Jack Todd who were visiting Jack's parents whose home was not far from ours. It turned out that Olga had heard of me when she visited my supervisor A.C. Aitken in Edinburgh. I remember little of my first meeting with Olga, but for years she would tell me I was surrounded by three small children and looked like a boy myself (at age 26). Jack has reminded me that we walked Olga and him back to his parents' house and that his father said "Bring in the wains" when he saw us.

Occasionally I would wonder whether Olga had been the referee of my first paper [1] written two years earlier while I was a graduate student. About 25 years later I dared ask her whether this was so. She told me plainly that I should not have asked, but admitted that I was right. I got punished for my question. During her "Torch" talk [2] at a SIAM Linear Algebra meeting in N. Carolina I interrupted her with some small comment and she rebuked me publicly with "Let me say it my way; I refereed your first paper!"

In 1976 I was invited to speak at a meeting in honor of Olga Taussky at Caltech and I wished to illustrate the influence of her work on other mathematicians by describing the history of three classical topics within matrix theory which are well described in Johnson's article [3] in this issue: diagonal dominance, inertia theory and the Taussky unification problem. In particular, of course, I wanted to describe the effect on my work. I had used her famous

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expository paper on diagonal dominance [4] in the paper [1]. Further, in the introduction to my joint work with Alexander Ostrowski on inertia theory [5] there is a sentence which credits her with sparking our investigations. In the Caltech talk I mentioned these matters and I also talked about the unification problem [6], posed by Olga in 1958, where she asked for common proofs of certain similar properties shared by three classes of matrices. Put this way, it is clear that many different results could be considered a solution or partial solution of this problem, which explains why the problem has remained fruitful for a period of 40 years. Examples of solutions are [7–9] or [3]. I mentioned a solution due to Engel and myself [10], where we constructed new classes of matrices which we called ω and τ matrices. These matrices were named after the initial letters of Olga's name, or more precisely misnamed as o should replace ω . I did not want to attach her name to these classes as I feared they might turn out to be of little interest. Fortunately this was not so, as several papers on these matrices were subsequently published by others and one problem that Engel and I posed is still open: Are all τ matrices stable? I now wish I had been a bit bolder.

I wrote an article [11] on this talk whose original title was "Olga Taussky-Todd's influence on mathematics and mathematicians", which expressed the intent of what I wanted to illustrate through specific examples. I sent the manuscript to Olga. A small but curious problem now arose. One day I received a call from Jack Todd who told me that Olga's contributions were much wider than the three problems discussed. I knew this, of course, so I changed the title to "Olga Taussky-Todd's influence on matrix theory and matrix theorists" and added a short preliminary paragraph explaining some of her other contributions to various fields. A few years later, when reading her autobiographical essay in "Mathematical People" [12], I realized that Olga was pleased with my article (referred to by its original title), but her words also show concern that readers should understand that there was much research of hers that I had not discussed. So my title change did not solve the problem. I consoled myself with another remark of Olga's: "The reason that references have to be confidential is that however much you praise a person's work, he will feel it's not enough". It took me some time to realize that this remark could be applied with equal justice to myself in this context. As I discovered again as editor of Wielandt's "Mathematical Works" [13], writing articles about a living mathematician's research has many pitfalls, however much the motivation comes from admiration of his or her mathematics.

Speaking only of mathematicians older than I, there are several to whom I personally owe a major debt of gratitude: Alexander Aitken, Alexander Ostrowski, Alston Householder, and Helmut Wielandt (in the order in which I met them). But my debt to Olga Taussky is greatest of all, and this in spite of the fact that my direct contacts with her were limited to occasional meetings. And there are several reasons for this beyond her undoubted influence on my work.

The first such reason is again personal. In 1961 my tenure at the University of Wisconsin was opposed by a prominent member of the department on the grounds that I was working in a well-worn field (i.e. matrices). Supported largely by analysts in our department, I was promoted to tenure nevertheless. A mere six year later I became chairman of our department and one day I realized I had access to all confidential files, including my own. So, I read what had been written about me at the earlier time. If ever there was a letter which was “good enough”, contrary to Olga’s remark about the reason for secrecy, this was her letter, for it helped to get me tenure. I recall it as a very realistic evaluation showing both my contributions and their limitations. I never dared to tell her of what might be regarded as a breach professional ethics, nor have I ever told anyone else before.

A second reason is more general and more important. Olga showed that matrix theory was not merely a part of algebra which was now largely superseded by the theory of vector spaces. Her example demonstrated that it was a re-emerging a field in its own right, with connections to several other fields of mathematics, a field which however cuts across the traditional classification of mathematics into areas such as algebra and analysis. And she influenced and supported others working in this field. (It is noteworthy that similar points are made by all the other contributors to this issue.) In 1963 Rudolph Langer gave me the opportunity of organizing a conference entitled “Recent Advances in Matrix Theory” at the Mathematics Research Center of the University of Wisconsin, Madison, and in the preface to the volume [14] containing the addresses of the invited speakers (Olga Taussky among them) I wrote:

The matrix theorist must not confine his interests to only one branch of modern mathematics. Rather, he must be a technician whose special skills are applied to problems in algebra, analysis, computation, number theory, combinatorial analysis or topology as the need arises.

If these words were written today I (and many others) would add the mutually fruitful interrelation of matrix theory or linear algebra and various branches of applied mathematics, such as operations research, systems theory, statistics and with subjects such as electrical engineering. The pioneering efforts of Olga Taussky and a small group of others were crucial here.

Olga has in several places explained her original interest in matrix theory as having been stimulated by her work during the second World War. An illustration is provided by the opening words of her extraordinarily interesting article [15] in Helmut Wielandt’s “Mathematical Works” [13].

It is a curious coincidence that in both Wielandt’s case and my own, our interest in matrix theory was generated by our involvement in aerodynamics in WWII.

But it is also remarkable what she does *not* say here. No one reading the quotation without knowing the circumstances could guess that Wielandt and she were working for opposing sides in a horrendous conflict. It should be noted that this is said in a section her article entitled “Personal Contacts” (with Wielandt) not confined to mathematics. And I believe there may be an explanation, though any explanation applying to large groups of people is necessarily shadowy.

Olga belonged to a generation born at the turn of the century in Central Europe whose lives were dominated by two world wars, a generation which I had the opportunity to observe in the persons of my parents. Many of this generation took chaos for granted and saw no need to recount their experiences when writing for others whose lives had been disrupted by the same turmoil. It was a way of rising above circumstances and retaining one’s humanity.

I recall a conversation I had with Olga at a meeting in 1963 in Boulder, Colorado. There was a session of the Mathematical Association of America in memory of Emil Artin whose speakers were Hans Zassenhaus and Helmut Hasse. Some people refused to attend Hasse’s talk because of his cooperation with the Nazis while he was head of the Mathematics Institute in Goettingen of which Olga had been a member at one time. I asked Olga whether she would go to the talk. She replied that, yes, she would and that Hasse had always treated her well. Jack Todd has pointed out to me that Olga had the same attitude to some other Germans who had been involved with the Nazis and had behaved decently to her. Here I am not evaluating the actions or motives of Hasse or of other mathematicians; I am describing an attribute of Olga’s that needs to be understood and respected. Her ability to see beyond politics or nationality when assessing the quality of a man or a woman was an essential ingredient of her character.

To paraphrase Fritz Bauer’s observation in this issue, Olga is a model for all of us.

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