

JUOZAS BANIONIS\*

## THE FAMOUS MATHEMATICIAN OF LITHUANIAN UNIVERSITY OTTO THEODOR VOLK (1892–1989)

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### ŚLAWNY MATEMATYK UNIWERSTYTETU LITEWSKIEGO OTTO THEODOR VOLK (1892–1989)

#### Abstract

The article introduces a German mathematician Otto Theodor Volk (1892–1989), who worked as a professor at Lithuanian University in 1922–1930, and sheds light on his merits in the science of mathematics in Lithuania.

*Keywords: Lithuanian University, mathematics, differential geometry, theory of functions, history of mathematics, philosophy of mathematics*

#### Streszczenie

W artykule przedstawiono niemieckiego matematyka Otto Theodora Volka (1892–1989), który był profesorem Uniwersytetu Litewskiego w latach 1922–1930. Zaprezentowano również jego zasługi dla rozwoju matematyki na Litwie.

*Słowa kluczowe: Uniwersytet Litewski, matematyka, geometria różniczkowa, teoria funkcji, historia matematyki, filozofia matematyki*

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## 1. Introduction

In the independent Republic of Lithuania, Otto Theodor Volk became the most prominent scholar in mathematics among professors of Lithuanian University.

On 16 February 1922, when Lithuanian University was established, the core of the Faculty of Mathematics and Natural Sciences of the university was created. The rest of the research staff of the faculty was to be formed on a competitive basis. Vacant positions at the faculty were announced in the daily newspaper *Lietuva* on 22 July 1922. The announcement was also addressed to Universities in Berlin, Munich, Königsberg, Vienna, Tartu, Riga, Zürich, and Helsinki. Among the candidates who applied for the position of a professor of differential equations and higher algebra there was an associate professor doctor O. T. Volk from Munich University<sup>1</sup>.

## 2. Beginning of the story of O.T. Volk's life

On 13 July 1892, a fifth child was born to the family of the Volks who lived in a town of Neuhausen on the Filder plateau south of Stuttgart, in the Baden-Württemberg Land<sup>2</sup>. The child was given a Christian name Otto and brought up following catholic traditions. O.T. Volk studied at gymnasiums in Rottenburg and Ehingen. After passing school-leaving examinations, he studied in Tübingen University, Munich Technical Higher School and Munich University. Besides mathematics, O.T. Volk took courses in astronomy, history and philosophy. He attended the lectures of such famous scientists as O. Perron, K.O.H. Liebman, C.L.F. von Lindemann, A. Voss, A. Pringsheim.

O.T. Volk finished studies in 1917 and passed examinations for teacher's qualification in Stuttgart. In 1919, under the supervision of a specialist in differential geometry K. Liebman, he wrote a research work *A Study of Potential Theory: The Problem of the boundary Values* and defended the work in Munich Technical Higher School acquiring Doctor's degree in Engineering. After working as teacher for a short time in Swabia, in 1919 O.T. Volk moved to Munich University to work as an assistant of C. Lindemann, who was a well-known specialist in number theory and algebraic geometry. A year later, O.T. Volk presented another scientific work *Expansion of Complex Functions of one Variable in terms of Elliptic Cylinder Functions*. He was awarded Doctor's degree in Philosophy (PhD) for this work. This scientific work enabled O.T. Volk as a young scientist to highlight the importance of computational methods.

O.T. Volk was awarded Doctor's degrees in engineering and philosophy for scientific works in the field of mathematics<sup>3</sup>. In subsequent research he concentrated on special functions and extension of the calculations of differentials by fundamental functions. On 4 March 1922, O.T. Volk completed the habilitation procedure and acquired the rank of Associate Professor in Munich University. O.T. Volk worked at Munich University until his invitation to Lithuania.

<sup>1</sup> J. Banionis, *Matematikos mokslo raida Lietuvoje 1920–1940*, Vilnius 1994, p. 27.

<sup>2</sup> W. Barthel, *Zum 85. Geburtstag von Otto Volk*, Würzburg, 1977, p. 1.

<sup>3</sup> O.T. Volk, *Gesammelte Abhandlungen*, Würzburg 1990, p. 687.

### 3. Invitation to Kaunas

On 24 September 1922, the Board of the Faculty of Mathematics and Natural Sciences of Lithuanian University considered the applications of the candidates for the university's vacant teaching positions and approved O.T. Volk's application, inviting him to teach at Lithuanian University<sup>4</sup>. The newly established Lithuanian University had great expectations from O.T. Volk. These expectations were fulfilled, especially in the field of mathematics. What were the key factors which shaped the decision to invite O.T. Volk to Lithuanian University? First of all, O.T. Volk was a graduate of Munich University, which had deep mathematical traditions. Secondly, since the candidate would also have to teach at the Technical Faculty, Doctor's degree and education in engineering would strengthen O.T. Volk's position. Besides, O.T. Volk had published research works in a number of journals in Germany and some books on complex number theories. Positive references provided by famous professors A. Voss and C. Lindeman were also very important.

"Since the university is primarily the place for pure spiritual sciences and the place where sciences are cherished, our first duty is to promote and develop pure science for its own sake. The highest aim of science is the triumph of spirit and our main objective is to carry out research and push science forward"<sup>5</sup>. It was the credo of Lithuanian University, which was then taking only its first steps. The credo was outlined by a young 30-year-old professor who finished his work in Munich and started professorship at the Department of Mathematical Analysis in Kaunas on 1 April 1923. As the head of the department, O.T. Volk put a lot of effort in taking science of mathematics to a higher level. He also made contacts with scientists from Germany, Sweden and other countries. This endeavour was aimed at making Lithuanian University equal to other European universities.

### 4. Working at Lithuanian University

From the very first years of working at Lithuanian University, O.T. Volk energetically started his activity. At first, he offered courses in higher algebra, differential equations, and function theory. Since autumn 1925, he began running courses in analytical mechanics and number theory. In spring 1928, O.T. Volk introduced Fourier series, theory of complex functions and elliptic functions. At the beginning, these courses were offered in German. In three years the professor could already teach students in Lithuanian.

In the process of forming the Department of Mathematics and following the ideas of German universities, O. Volk initiated establishing of Mathematics Seminar and a mathematics library. O.T. Volk suggested purchasing the library of the Munich University professor Aurelius Voss, who was O.T. Volk's teacher, as the basis for the collection of the library. A. Voss's library contained around 2000 volumes and 4500 offprints and brochures on algebra, geometry, and mechanics. One could find here classical works of C.F. Gauss, P.G.L. Dirichlet, I L. Fuchs, J. Steiner, and 96 volumes of the famous Encyclopaedia of Mathematical

<sup>4</sup> Faculty of Mathematics and Natural Sciences Board, minutes of meetings in 1922., LCVA (Central State Archive of Lithuania), F.631, Ap.1, B.118, L.179

<sup>5</sup> O. Folkas, *Matematika ir pritaikomieji mokslai*, Kosmos, No. 4, 1924, p. 313.

Sciences<sup>6</sup>. The library also contained thoroughly arranged volumes of worldwide-known long-established journals “Mathematische Annalen” (109 volumes since 1869), “Journal für die reine und angewandte Mathematik” (Crelles Journal, 60 volumes since 1863), “Archiv der Mathematik” (since 1841), “Jahrbuch über die Fortschritte der Mathematik” (since 1871) and other issues. In 1924, the whole library was purchased for a modest sum of money, i.e., \$ 2000 (approximately 20 000 Litas), and moved to Kaunas. A year later, O.T. Volk helped to enrich the library with books bought from a German scientist Carl Neumann<sup>7</sup>.

Newly established Seminar of Mathematics had a great role in development of research in the field of mathematics. O.T. Volk was elected the head of Seminar of Mathematics on 24 January 1925. It was the place for mathematicians to get acquainted regularly with the original research carried out in Kaunas, as well as to explore the heart of scientific works of Europe and other parts of the world.

Seeing the shortage of Lithuanian textbooks for higher schools and understanding the importance of studies in the native language, O. T. Volk found the ways to overcome the drawback. Thus he became the author of the first mathematics textbook for higher schools which was published in “Spindulys” publishing house in 1929. As the Board of Mathematics pointed out, in the textbook “Lectures on Theory of Ordinary and Partial Differential Equations” “(...) everywhere, attention is paid to geometric interpolation of integral curves, most importantly in the parametric form”<sup>8</sup>. The statement acknowledged that the textbook conformed to the modern science of mathematics. Since the textbook was essential for students, it was decided to publish 1000 copies at the faculty’s expense. The textbook was illustrated with examples and mathematical problems from different areas of mathematics. It also included a long list of supplementary literature.

O.T. Volk’s doctorate student Petras Katilius (1903–1995) helped the professor to carry out the gigantic work of writing the textbook. O.T. Volk and P. Katilius translated O. Volk’s German textbook. Lithuanian mathematics terminology was adapted by O. Volk’s friend, an Honorary Doctor of mathematics at Lithuanian University, the prelate Aleksandras Jakštas-Dambrauskas (1860–1938). The originality of the work was confirmed by the fact that the textbook was quoted in the famous E. I. H. Kamke’s textbook *Differential Equations*. Students printed two more books, i.e. *High Algebra* (1925) and *Analytical Mechanics* (1929) taking O. Volk’s lecture notes as the main material for these books. O.T. Volk mentioned one more textbook in Lithuanian related to Kaunas period – *Theory of Functions*. However, this textbook or even its manuscript cannot be found in the collections of Lithuanian libraries.

It is necessary to emphasize that these textbooks were prepared and published in the Lithuanian language. Material in the textbooks broadened, consolidated and complemented knowledge of higher mathematics in Lithuania. The textbooks also were

<sup>6</sup> Faculty of Mathematics and Natural Sciences letter on naming A.Fosui the mathematics honorary professor, LCVA (Central State Archive of Lithuania), F.631, Ap.1, B.98, L.59.

<sup>7</sup> Faculty of Mathematics and Natural Sciences commission letter, 20/11/1924, LCVA (Central State Archive of Lithuania), F.631, Ap.1, B.138, L.171.

<sup>8</sup> Decision of Faculty of Mathematics and Natural Sciences Board, 22/11/1927, LCVA (Central State Archive of Lithuania), F.631, Ap.1, B.137, L.74.

the basis for creating and standardizing Lithuanian terminology of mathematics. Thus, all the textbooks contributed to the foundation of science of mathematics in Lithuania.

The works carried out by O.T. Volk embraced a wide spectrum of areas of mathematics. A. Voss fostered O.T. Volk's interest in differential geometry. O.T. Volk's research of the nets of non-isometric isogonal curves was significant, too. He also wrote about K. Liebman remarks concerning J.G. Darboux's equation when he worked on surfaces with the nets of rhombic, triangular, circular and other curves.

Another important part of O.T. Volk's scientific interests was related to theory of functions. Works dedicated to that aspect focused on the expansion of analytic functions in series of Hermite and Laguerre functions, generalisation of the conformal image to a complex algebraic function in two variables, Lamé function series and C.L.F. Lindemann result. O.T. Volk's works on boundary value problems in potential theory should be mentioned, too. O.T. Volk published his works in journals of Bavarian Science Academy, Heidelberg Science Academy and Lithuanian University.

Since O.T. Volk was familiar with pure and applied mathematics theory very well and thoroughly used references, his merits in the history of mathematics are evident. His articles published in the third decade of the 20<sup>th</sup> century in philosophy and natural sciences journals "Logos" and "Kosmos" were very significant, too.

In 1924 O.T. Volk published an article about B. Pascal as a mathematician and physicist, highlighting his merits not only in "abstract mathematics" but in creating a calculating machine. In O.T. Volk's considerations about J. Kepler's "Mysterium cosmographicum" one can find that the author philosophically described J. Kepler's work as a phenomenon of astronomy, theology, physics and mathematics.

In 1925 O.T. Volk published an article *Kant and Mathematics*, in which he formulated some problems. In the article he made some comments concerning the deceased Munich astronomer H. von Seeliger and a well-known mathematician F. Ch. Klein. Merits of the latter are mentioned in the following areas: theories of algebraic equations and elliptic functions, reform of teaching of higher mathematics, publishing of "Encyclopaedia of Mathematical Sciences". O.T. Volk also discussed the questions of mathematical physics which were studied by a Russian mathematician V. Steklov.

To commemorate 200<sup>th</sup> anniversary of I. Newton's death, O.T. Volk published a comprehensive article in which he reviewed works of I. Newton's predecessors and also discussed correlation of A. Einstein's relativity theory with I. Newton's mechanics. Another article was dedicated to commemoration of C. Lindemann's 75<sup>th</sup> jubilee. C. Lindemann was O.T. Volk's teacher and a scholar who studied Ludolph's number  $\pi$ . The great mathematician was presented not only as a researcher of the problem of the quadrature of the circle but as a personality, too.

In 1927, after the death of two mathematicians, i.e. "the father of applied mathematics" C.D.T. Runge and a Swedish mathematician, the founder of "Acta Mathematica" M.G. Mittag-Leffler, O.T. Volk published two more articles in the "series of commemoration". In the article he mentioned the Swedish mathematician's, who was a specialist in differential equations, positive attitude towards Lithuanian University. It is worth mentioning, that M.G. Mittag-Leffler sold to Lithuanian University 26 issues of the journal, whose editor he was, at the lowest possible price.

Prof. O.T. Volk was also interested in philosophy. O.T. Volk's philosophical ideas are reflected in three original articles, two of which we mention here. In the first article *Mathematics and Applied Sciences* O.T. Volk tried to define the place of mathematics among other natural sciences supporting his own considerations by ideas of great thinkers.

The problem of mathematics and faith is analyzed in the article *Mathematics and Worldview*. O.T. Volk had deep understanding of theological problems. In 1915 he was ordained a catholic priest. O.T. Volk admitted that "faith, i.e. transcendental thesis of mind, without which the whole science is dead and totally irrelevant, does not begin only with God, liberty and immortality"<sup>9</sup>. In the other article *On Mathematical Cognition* O.T. Volk discussed evolution of science and its significance<sup>10</sup>.

O.T. Volk's articles on history of mathematics familiarised Lithuanian readers with world-famous personalities. He was acquainted with a number of mathematicians whom he mentioned in his articles and exchanged correspondence with some of them. That is why these memoir-like articles are so ingenious.

O.T. Volk knew Latin, Greek, and French. It explains why his articles are full of quotations from original classical works of such famous scientists as C.F. Gauss, C. Jacobi, G. Galilei, K.Th.W. Weierstrass and others. O.T. Volk's works will never lose their value since they are deep and broad.

The professor was faithful to theoretical mathematics. In the dispute about foundations of mathematics he declared himself an advocate of Hilbert. Advocates of Hilbert's view on mathematics neglected "intuitive mathematics". They did not take into consideration the meaning of the content and gave priority to mathematical formulae. Würzburg University professor W. Barthel characterized O. T. Volk as a pure analyst. W. Barthel claimed that "Clear and independent analysis rather than exploration of possibilities were means with which O. T. Volk proved theorems in geometry"<sup>11</sup>.

## 5. O.T. Volk's legacy to Lithuanian mathematics

At the beginning of his career at Lithuanian University, O.T. Volk proclaimed credo of his teaching: to deliver lectures "not only for benefit, i.e., their possible application in practice", but to try to develop in students the "spirit of pure erudition", to prepare them "for science for its own sake". Deliberately, the very first diploma works of mathematics students were supervised by O.T. Volk. 31 topics for diploma works from favourite areas of mathematics – theories of differential equations, special functions and functions of complex variable – were assigned to students by O.T. Volk during 7 years of his work at Lithuanian University in Kaunas. The professor supervised future famous mathematicians P. Katilius, M. Gotleras, O.Stanaitis, A.J. Gliksonas R. Lakovskis<sup>12</sup>.

For 6 years in turn O.T. Volk represented Lithuanian science of mathematics at international scientific events in Innsbruck, Munich, Münster, Düsseldorf, Königsberg

<sup>9</sup> O. Folkis, *Matematika ir pasaulėžiūra*, *op. cit.*, p. 67.

<sup>10</sup> O. Folkis, *Apie matematišką pažinimą*, Logos, 1925, No. 2, p. 85-114.

<sup>11</sup> Barthel W., *op. cit.*, p. 3.

<sup>12</sup> J. Banionis, *op. cit.*, p. 37.

and Boulogne where he initiated, maintained and strengthened relations between Lithuanian and European mathematicians. As he pointed out, these relations showed “great affinity towards Lithuanians”<sup>13</sup>.

In 1929, after the death of Würzburg University professor E. Hilb, O.T. Volk was invited to work at this university (being the disciple of E. Hilb). The invitation was accepted and on 20 January 1930 O.T. Volk, the only professor of mathematics at Lithuanian University, handed in the resignation starting 1 of May 1930. The life and activity of O.T. Volk (until 1988) was centered at Würzburg University, where he worked as a professor of mathematics and astronomy.

Before leaving Kaunas, O.T. Volk had prepared his successors for the Faculty of Mathematics and Natural Sciences of Lithuanian University (later renamed Vytautas Magnus University). Three of O.T. Volk’s former students – Petras Katilius, Paulius Slavėnas (1901–1991) and Otonas Stanaitis (1905–1988) – were admitted to doctoral studies at Heidelberg, Yale and Würzburg Universities with the mediation of the professor. Afterwards, these mathematicians became associate professors at the Faculty of Mathematics and Natural Sciences of Vytautas Magnus University.

O.T. Volk’s contemporaries and students characterised him as a strict, honourable and dignified man who constantly inspired others to search for the truth. In 1931, senior students of Lithuanian University sent the telegram to O. T. Volk in which they wrote: “For the rest of our life you will stay in the hearts of the Lithuanian youth”.

We have to admit that Prof. W. Barthel was right when he said that O.T. Volk’s activity “(...) in the university of the temporary capital of Lithuania carried personal risk and tremendous commitment”. In spite of that, O. T. Volk himself once claimed that “The years spent in Kaunas are among the best years of my life”<sup>14</sup>. Today, when we overview the development of science of mathematics in Lithuania and observe the achievements in mathematics, we are proud that Professor O.T. Volk was at the origins of our science, significantly contributing to the development of science of mathematics and culture in Lithuania.

*Translated into English by Linas Selmistraitis*



Fig. 1. Otto Theodor VOLK (1892–1989)

<sup>13</sup> O. Volk’s report, Innsbruck Congress of mathematicians, 1924. LCVA (Central State Archive of Lithuania), F.631, Ap.1, B. 137, L. 52.

<sup>14</sup> Barthel W., Zum 85. Geburtstag von Otto Volk, Würzburg, 1977, p. 3.

PAPRASTŲJŲ IR DALINIŲ  
**DIFERENCIALINIŲ LYGČIŲ**  
 TEORIJS PASKAITOS

VADOVĖLIS STUDIJUOJANTIEMS

Parašė  
**OTTO VOLK'AS**  
 DR. ING. IR DR. FIL.  
 LIETUVOS UNIVERSITETO MATEMATIKOS ORD. PROFESORIUS

Tekste 77 brėž. ir 301 uždavinių su atsakymais

KAUNAS ::::: 1929

Fig. 2. O. Volk “*Lectures on Theory of Simple and Partial Differential Equations*” – the first mathematics textbook for higher schools in Lithuanian

References

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- [5] O. Folkis, *Matematika ir pasaulėžiūra*, Logos, No. 1, 1924, 64-67.
- [6] O. Folkis, *Apie matematišką pažinimą*, Logos, No. 2, 1925, 85-114.
- [7] Central State Archive of Lithuania.