MATHEMATICS IN KAUNAS UNIVERSITY FROM 1919 TO 1940

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The history of the open university in Kaunas is closely connected with the history of the reestablishment by the tsar's government in 1832 of the closed Vilnius University. Kaunas University was a kind of extension of Vilnius University as well as a filling of the gap that was created in Lithuania after the tearing away of Vilnius by bourgeois Poland. In 1940, after the return of Vilnius to Lithuania, many of the faculties of Kaunas University, among them also the one of interest to us, the natural-mathematical one, were transferred from Kaunas to Vilnius and continued their activities in Vilnius University.

After the capture of Vilnius in 1919 by the troops of bourgeois Poland, the Soviet rule existing there was overthrown and all measures on the restoration of Vilnius University, undertaken by the Soviet People's Commissars who were headed by Vintsas Mitskyavichyus-Kapsukas, were frustrated. For several years (until 1921) there still existed an organized Lithuanian scientific society of Higher scientific courses, now deprived of its original aims. At the end of 1919, by decision of the Polish government there was opened in Vilnius the Stefan Batori University.

At this time, the most far-sighted representatives of the Lithuanian intelligentsia living in Kaunas, the provisional capital (after the capture of Vilnius) forming the Lithuanian Republic, began to raise the question of the creation in Lithuania of universities. Among these intellectuals were those such as the mathematician Zigmas Zhemaitis, the psychologist Ionas Vabalas-Gudaitis, who earlier participated in the measures for the restoration of Vilnius University.

The head of the Kaunas commercial college Z. Zhemaitis in September, 1919, prepared a memorandum (cf. [1, pp. 36-39]) in which he showed that it was necessary to establish an institute of higher education quickly, that this should be precisely a university, which should also fulfill the functions of a special higher technical school (polytechnic), and also prepare future agronomists. The memorandum was presented to the minister of education and the president of the republic, but the government did not decide immediately to set about the establishment of a university. Special objections were called forth from the applied faculties: they considered it premature.

After the refusal of the government to establish a university, Higher courses on public principles having six sections (faculties), among them medical and technical, were organized by a group of initiators. The mathematicians Z. Zhemaitis and P. Mashetas and the engineer K. Shakyanis were attracted to organize the physicomathematical section. The opening of courses took place on Jan. 27, 1920, but work in them began already in December, 1919. This was also the actual beginning of Kaunas University. The first instructor in courses was Z. Zhemaitis, and in later years I. Vabals-Gudaitis.

The organization of the higher courses not only speeded up the opening on Feb. 16, 1922, of Kaunas Lithuanian University (c. 1930 the university was named for Vitautas the Great), gave it the first students and instructors, but also influenced its structure: in the university, together with the united natural-mathematical faculty was the medical, but also, evoking the greatest objections, the technical faculty, because such were the sections in the higher courses.

From the outset it was envisaged that the natural-mathematical faculty would have four divisions with 22 departments. Among these were two in mathematics: the department of geometry and the department of mathematical analysis. From 1922 to 1940 there was published the journal "Trudy Fakul'teta Matematiki i Estestvennykh Nauk Litovskogo Universiteta." Thirteen volumes were published. All this time the mathematician extraordinary (later ordinary) Professor Z. Zhemaitis was reelected Dean of the Faculty.

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Z. Zhemaitis in 1922 organized the department of mathematical analysis. In November, 1923, under special contract as a foreigner, Privat-docent of the University of Munich, Doctor of Philosophy and Doctor of Engineering (both degrees were awarded to him for mathematical work) Otto Volk was named ordinary professor and head of this department. He gave lectures in higher algebra and analytical mechanics, on the theory of functions of a complex variable, on differential equations, and the theory of algebraic numbers. Part of his lectures were published by the society of students of mathematics and physics with the help of opalography [2, 3], and in 1929 an original textbook on differential equations [4], illustrated by examples from various domains of mathematics, taken from various scientific papers, among them those of O. Volk himself, was published by the faculty. About 30 student theses were written on its themes.

On the initiative of O. Volk in 1924, the Mathematical seminar was organized with reading rooms for staff and students. Through the mediation of O. Volk, the valuable library of his teacher, Munich Professor A. Voss, was purchased with rare books, classic works of mathematics, reprints of papers, theses (synopses), and the oldest complete sets of well-known journals.* Otto Volk lead the seminar and library. He remembered his great teacher with respect, the famous German mathematician F. Lindeman. Otto Volk worked in the Lithuanian University in Kaunas until 1930; in 1931 he returned to Germany and became a professor at the university in Würzburg.

From 1931 until the transfer of the faculty to Vilnius, the head of the department of mathematical analysis, the mathematical seminar, and the library was e.o. Professor (later ordinary) Viktoras Birzhishka, working in the department since 1922 (to 1928 as a docent). On the education of engineer–technologists he had an exceptional memory and gave lectures on many subjects: introduction to analysis [5], theory of indefinite and definite integrals [6], calculus of variations, theory of finite differences, theory of functions of a real and complex variable, elliptic functions, probability theory [7], analytical mechanics, and differential geometry. Synopses of these lectures on certain subjects (distinguished by numbers in the list of Literature Cited) were published by the student association.

After the departure of O. Volk in 1930, P. Katilyus, who had worked since 1926 as an assistant in the department, was named docent in the department of mathematical analysis. In 1927-1929, getting the Humboldt scholarship, he specialized in the domain of differential geometry at the oldest German university in Heidelberg under the guidance of Professor G. Liebman. In 1929 for a dissertation on differential geometry (theory of nets) he received the degree of Doctor of Philosophy, and in 1930, after habilitation in Kaunas, he became privat-docent. P. Katilyus gave lectures on analytic geometry, differential equations, theory of definite integrals, theory of algebraic numbers, calculus of variations, and faculty courses in projective and non-Euclidean geometry. In 1936 his lectures on analytic geometry were published with the help of opalography (on the author's text) [8], and in 1940, his textbook [9], published by the faculty, appeared; plane geometry was presented in oblique coordinates, emphasizing projective properties. In the text there were many problems on the construction of curves and surfaces of the second order on given elements. The lectures of Professor P. Katilyus read concisely with strict mathematical rigor and without superfluous words, emphasizing the leading idea.

In 1931 Otonas Edmundas Stanaitis began to work in the department of mathematical analysis. In 1930 and 1931, receiving the Humboldt scholarship, he specialized at Würzburg University under Professor O. Volk, where for a dissertation on potential theory he was awarded the degree of Doctor of Philosophy. From 1932, O. Stanaitis worked as chief assistant, and after habilitation in 1935, asprivat-docent. He gave lectures on mathematical analysis for technologists and on higher mathematics for chemists and also faculty courses on integral equations and potential theory.

Engineer Yulionas Graurogkas worked as docent and head of the department of geometry from 1922 to 1930. He taught analytic and descriptive geometry, then went over to the department of mechanics of the technological faculty. From 1931 the dean of the faculty Professor Z. Zhemaitis became the head of the department of geometry, going over from the department of mathematical analysis, in which he had worked since the beginning of the creation of the university. At various times Z. Zhemaitis gave lectures on higher algebra,

*There were the complete set of the journal "Mathematische Annalen" from the first number (1869), "Crelles Journal" from 1863, etc.

analytic geometry, definite integrals, Fourier series. Two editions of conspecti of his lectures on differential and integral calculus were published by the students [10]. During the time of his work at Kaunas University, Zemaitis gave lectures on the history of mathematics, methods of teaching, and devoted most of his attention to the preparation of mathematics teachers. He was successful in getting future teachers to study pedagogical practices in middle schools (gymnasia) even if only to a minimal extent. And this was difficult, since schools were not obliged to take probationers and everything depended on diplomatic abilities, teaching methods, and the good will of the teacher or leaders of the school.

Understanding well the difficulties of students in transition from middle schools (gymnasia) to higher, Z. Zemaitis always stressed that mathematical rigor must be introduced gradually, no earlier than the pupil or even student was able to understand the necessity for this rigor. He gave lectures systematically accessible even to average students. In the complete absence of control over attendance his lectures were almost one hundred per cent.

On the other hand, Z. Zemaitis gave a great deal of attention to the modernization of the school mathematics program. In his paper [11] and in the materials of the committee he headed on drawing up new programs in mathematics, physics, and cosmography, there were developed and scientifically established new methodical principles using the newest world achievements in the pedagogical sciences of that time, in particular, the ideas of Felix Klein. Z. Zemaitis frequently criticized the isolation of old programs from life, and scholastic methods of instruction. In the new programs it was proposed to gradually and profoundly study the concepts of functions, with which the account of many parts of mathematics was communicated. He stressed the necessity of a profound study of the concept of number, gradually extending this concept over the duration of the whole mathematical curriculum.

At the end of the curriculum (in the 7th and 8th classes) he outlined a generalization of mathematical knowledge and indicated further perspectives: he gave the rigorous concepts of function, limit, derivative, integral, and their applications, he generalized the concept of number. He introduced a rather extensive course in analytic geometry with the study of curves of second order, with the equations of curves in polar coordinates. The concepts of analytic geometry and the study of curves he connected closely with the differential calculus, forming a united system.

In the program he also emphasized the necessity of giving the students historical information, of indicating the continuity of the development of mathematics, and of the fact that school mathematics is only the first stage in its knowledge.

Z. Zemaitis took part in the development of a Lithuanian mathematical terminology and prepared a collection of terms in geometry and trigonometry [12].

The astronomer P. Slavenas and O. Stanaitis worked temporarily as assistants in the department of geometry, and from 1930 to 1940 so did Ruvinas Lakovskis who fell prey to the Hitler terror in 1941.

In view of the small number of scientific—pedagogic staff, only the differential calculus and also analytic geometry were taught annually (in the first course, simultaneously for students of the natural-mathematical faculty — mathematicians and physicists — and for all students of the technical faculty). The remaining mathematical disciplines were taught every other year to the students of two amalgamated courses. History and methods of teaching mathematics were not obligatory to get a diploma but, together with pedagogics, history of pedagogics, logic, and psychology, taught by other faculties, were obligatory for future school teachers. The entire plan of instruction was confined to 4 years, after which only a small part of the students finished the university.

The mathematical section of the natural-mathematical faculty graduated 104 students. Most of them became middle school teachers. There were no graduate-students, but those leaving the university were sent for advanced studies abroad in so far as possible to West European universities.

The mathematics faculty worked basically in the field of special functions and differential geometry — curvilinear nets on surfaces, and also the history of mathematics.

O. Volk published several papers in the Transactions of the faculty in which he considered the expansion of a function of a complex variable in terms of Hermite and Laguerre functions [13], potentials of a simple and a double layer of a circular disk, logarithmic

potentials of a simple and a double rod [14], the conformal mapping $\zeta=(\sqrt{z^2-b^2}-\sqrt{z^2-c^2})/\sqrt{c^2-b^2}$ [15].

Working at Kaunas University, O. Volk published a series of papers in German journals. Except for the paper on the expansion of a function of two complex variables in a series of Lamé functions [16], all the other papers published abroad are devoted to the theory of nets. In these papers he considered rhombic nets of straight lines [18] or of geodesic lines, in particular on surfaces of constant curvature [19]. In other papers he considered triangular nets from three families of geodesic lines on surfaces with constant curvature [20] and on surfaces of rotation [21] and also the general form of surfaces on which geodesic curves can form a triangular net [22]. One paper is devoted to special nets formed from circles [23].

In the last paper [24] published at Kaunas, O. Volk found all surfaces on which there exist isogonal rhombic nets with constant angle, formed from curves having constant geodesic curvature, and proved a series of properties.

P. Katilius in [25] proved that geodesic rhombic nets, whose diagonals are lines of curvature, are possible, except for the plane and developable surfaces, only on surfaces of rotation or on second-order surfaces. He also studied the structure of semirhombohedric nets of curves in a space and found criteria for three families of curves, defined by differential equations, to form a triangular net and also criteria for the integral surfaces of four Pfaffian equations to divide the space into Zauer cells.

Stanaitis [26, 27] constructed systems of integral equations which ellipsoidal Lamé functions of a Jacobian form satisfy. The kernels of these equations are conjugate to the Legendre functions of the derivatives of the Jacobian elliptic functions. Certain of these equations were found earlier by the English mathematician Whittaker [28] and also after publication of the paper of Stanaitis, but apparently independently, by the Soviet mathematician Koshlyakov [29]. In the papers of Stanaitis, the same Lamé functions satisfy different integral equations with linearly independent kernels. He also obtained integral equations for the Lamé functions which are not polynomials, even for the Lamé functions expressed in terms of the Weierstrass elliptic function. These equations include all known integral equations for the Lamé functions.

In an earlier paper of Stanaitis [30] (his dissertation), the same functions were applied to the calculation of the potential of a triaxial ellipsoid for given values on its surface.

Z. Zemaitis started the first investigations into the history of mathematics. In the monograph (1930) "Mathematical historiography and Moritz Cantor" [31], devoted to the author of the fundamental work "Lectures on the History of Mathematics" on the occasion of the tenth anniversary of his death, Z. Zemaitis, relying on broad material and stressing Cantor's merits, considered both the critical remarks of Enestrom, etc., and the reasons for his oblivion.

No less interesting, but more popular was the earlier paper (1927) of Zemaitis about Isaac Newton [32], in which he illuminated his many-sided activities and the arguments about the priority of Newton and Leibniz. On the occasion of the 200th anniversary of the death of Newton, his paper and Volk [33] were published simultaneously. He particularly emphasized the works of Newton on the foundations of mechanics, considering them Newton's principal merit. One paper of Volk was devoted to Mittag—Leffler [34].

A survey paper on the contemporary state of Fermat's problem, directed against Fermatists, was published by Lakovckis, Assistant in the Department of Geometry [35].

Honorary Professor (since 1922) of the Lithuanian University and Honorary Doctor of the natural-mathematical faculty, the writer Aleksandras Dambrauskas (Adomas Yakshtas) constructed what he called new trigonometric systems [36]. Adjoining to six trigonometric lines the radius r and the angle of direction of the lines of sine and tangent φ and considering two of them as constants (in our system $r=1, \varphi=\pi/2$) he got $C_8^2=28$ simple and, connecting the cited quantities by arbitrary relations, an unbounded number of compound trigonometric systems. Compound orthogonal (for $\varphi=\pi/2$) systems are considered in two papers [37] of the Transactions of the faculty. Under the pseudonym of Yakshtas, he wrote an interesting popular historic survey of three important problems [38] of antiquity: squaring the circle, doubling the cube, and trisecting the angle.

Gerardas Zilinskas, an absolvent of Kaunas University, in his papers on the theory of numbers, studied the class number of indefinite quadratic forms [39] and the product of four linear forms [40]. For both papers (the second was published later) he was awarded the degree of Doctor of Sciences by Manchester University.

G. Zilinskas worked as senior instructor in the department of geometry from 1940, by then after the transfer of the faculty to Vilnius.

Of the absolvents of the faculty, defending dissertations, but not working in Lithuanian high schools, one can mention A. Glikson, who specialized in Würzburg under the guidance of Prof. O. Volk in 1931-1932, where he was awarded the degree of Doctor of Philosophy.

Cases of graduates of Lithuanian middle schools who did not study at Kaunas University getting higher education and a learned degree abroad were rare.

Among mathematicians of this exceptional type there was the graduate of the Shyaulyai Gymnasium, Kazimeras Miecevicius, who got his higher education and the degree of Doctor of Philosophy for his dissertation on the theory of functions [41] at Bern under Professor Krel'.

In addition to those mentioned, there was published by mathematicians of the natural-science faculty of Kaunas University a series of popular papers on mathematics and mathematicians. Such are the papers by O. Volk on B. Pascal on both physics and mathematics [42], on "the conquering of the number π" by Lindeman [43], and the obituary on the occasion of the death of the Russian mathematician Steklov [44]. Katilius wrote a paper on the development of non-Euclidean geometries [45], and V. Birziska one on the development of probability theory [46]. Katilius [47] and Masaitis [48], a graduate of the faculty, published in 1938 a paper on the self-taught mathematician, the Lithuanian poet A. Baranauskas, whose results on properties of arithmetic functions were published in two papers: one by the German mathematician Hossfeld [49], the other on his recommendation by Baranauskas himself [50]. Birziska, Katilius, et al. published many papers in the volumes of the Lithuanian Encyclopedia [51] which was being published at that time, and whose publication would have been impossible without the existence of the university.

Graduates of Kaunas University were authors of textbooks for middle schools along with older experienced teachers. After the inclusion of higher mathematics in the program of the gymnasia, Bronyus Ketarauskas prepared a textbook on the foundations of the differential calculus [52]. Kazimeras Vaicekauskas prepared a textbook on geometry for the 1st, 2nd and 3rd, 4th classes of the gymnasium on the new program [53] and also a collection of problems on geometry [54]. Kaziz Macernis, who fell prey to the Hitler terror in 1941, prepared a textbook on methods of teaching arithmetic and geometry in elementary schools [55].

There was prepared, under the editorship of V. Birziska, Antanas Busilas, and Zigmas Balutis (Balyavichyus), a modernized textbook on algebra in five parts [56], which was ahead of its time and not always successful. Professor V. Birziska also edited a collection of geometric problems on the application of the trigonometric functions of Antanas Grazelis [57].

Kaunas University began its existence in the difficult period after the first world war in an almost empty place, since there were no high schools in prewar tsarist Lithuania. There were also no middle schools in the Lithuanian language, and up to 1904 for 40 years there were practically no legal presses.

Only after 1904 did there begin to appear books and journals in the Lithuanian language, and in 1907, in Vilnius, there was founded the Lithuanian Scientific Society.

The activities of Kaunas University can now be looked at modestly, but their value for Lithuania and the Lithuanian people cannot be overestimated. Founded under difficult conditions, Kaunas University prepared qualified personnel for middle schools and for all areas of life, among them also the first scientific—pedagogical personnel of Vilnius State University. This relates in full measure to mathematical personnel also. On the basis of the two faculties remaining after 1940 in Kaunas University, two institutes were founded in 1950 — the Medical and the Polytechnic. It is remarkable that in the latter as well as in Vilnius University, and also in other high schools of the republic, there are still working mathematics graduates of Kaunas University and their students.

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