

Wilhelm Matzka (1798–1891)

Michaela Chocholová

English Summary

In: Michaela Chocholová (author); Ivan Štoll (author): Wilhelm Matzka (1798–1891). (English). Praha: Matfyzpress, 2011. pp. 217–[224].

Persistent URL: <http://dml.cz/dmlcz/402198>

Terms of use:

© Michaela Chocholová

© Ivan Štoll

Institute of Mathematics of the Czech Academy of Sciences provides access to digitized documents strictly for personal use. Each copy of any part of this document must contain these *Terms of use*.



This document has been digitized, optimized for electronic delivery and stamped with digital signature within the project *DML-CZ: The Czech Digital Mathematics Library* <http://dml.cz>

SUMMARY

Wilhelm Matzka (1798–1891) was a German mathematician as well as an important person of the University of Prague and an eminent representative of the mathematical community in the Czech countries in the middle of the 19th century. His extensive scientific and pedagogical activity sank into oblivion in process of time and in context of the “Czech Nation Revival”. This thesis reminds of his life, scientific, pedagogical and organizational activities. The center of this work is formed by the analysis and the evaluation of Matzka’s mathematical work, its classification in the development of mathematics and its education. This thesis presents also lot of historical connections and provides a view of the situation in the German, Czech and European world of mathematics in the 19th century. It mentions Matzka’s works on mathematical applications like physics, chronology, astronomy and geodesy, which form almost the half of all his publications. These are giving the thesis a significant interdisciplinary character.

Biography of Wilhelm Matzka

Wilhelm Matzka was born on November 4, 1798 in the South Moravian town of Litobratřice, as the son of a sergeant of the imperial cavalry regiment Franz Matzka and his wife Emerentiana Schierer. As a small boy, he moved to the North Bohemian region, where he attended several primary schools located in the area of Teplice and passed his grammar school education in Chomutov in the years 1809 to 1817. From 1817 to 1819, he studied at the Faculty of Arts in Prague, where he attended the following courses: religion (B. Bolzano), history (F. N. Tietze), Greek (A. Klar), theoretical and practical philosophy (F. X. Němeček), mathematics (J. L. Jandera) and mathematical physics (F. I. C. Hallaschka). He was an exemplary student and passed all of his examinations with excellent results.

After having finished his university education, he served almost eighteen years (1819 to 1837) in the Austrian army in Vienna; as a cannoneer at first, further as a bombardier, a (chief) gunner, finally as a lieutenant by the Viennese bombardier corps (das k. k. Bombardier-Corps). This corps took care of a further training and education of its members as well; for this purpose a special corps school (die k. k. Bombardier-Corpsschule), situated directly in its barracks, was established (already in the year 1806). The focus of this school was the training of bombardiers activities, such as cannon service and the production of ammunition. Talented students were additionally educated in mathematics, mechanics, natural and military science.

At the time of his activity in Vienna, W. Matzka complemented and deepened his knowledge and education not only by attending the courses at the corps school, but also by visiting facultative lectures on scientific and practical astronomy (J. J. Littrow), higher mathematics and physics (A. v. Ettingshausen), mineralogy (F. Mohs) at the University of Vienna, and lectures on technology (G. Altmütter) at the Vienna Polytechnic. At the same time he was also

a teacher of higher mathematics (analysis, analytic geometry) and mechanics at the bombardier corps school. Subsequently he decided for an academic career out of military.

He was appointed full professor of elementary mathematics at the philosophical school in Tarnow in 1837. He stayed at this school for almost twelve years, until 1849, when he left towards Prague. While he was active in Tarnow, W. Matzka passed rigorous exams in general history and philosophy at the University of Olomouc in 1843 and gained the degree of Doctor of Arts and Philosophy.

Shortly after moving to Tarnow, W. Matzka got married to Teresa Botho. There were three sons born in their marriage, Vincenz (1840–?), Wilhelm (1841–1899) and Ludwig (1845–1904). Matzka's wife died on May 1847, which was a painful bereavement for the whole family. The last years in Tarnow, W. Matzka spent his personal as well as professional life very unhappy. All the more he wished to go back to Prague and get a prestigious professorship there.

W. Matzka got the position of professor of elementary mathematics and practical geometry in the German language at the Prague Polytechnic in 1849. These lectures were concentrated on completing and deepening the preliminary mathematical education and played a very important role in the educational system at the Polytechnic. Especially he taught arithmetic, algebra, plane and solid geometry, trigonometry, as well as principles of probability calculus, theory of equations and analytic geometry. Further, he helped by teaching higher mathematics and preparing for geodetic surveys, and attended the collection of geometrical models, too.

He was appointed full professor of mathematics in the German language at the University of Prague already in 1850. He taught there for more than twenty years, until 1871. He lectured on algebra and higher mathematics, with focus on differential and integral calculus and their applications in geometry and physics. He devoted special attention to geometry. Next to plane and solid geometry, he taught on analytic geometry, spherical trigonometry and its applications in geography and astronomy. Further, he focused on actual and modern mathematical themes, such as probability calculus, number theory, higher equations and theory of surfaces. Most of these topics were completely new for the university students. Moreover, since 1855/1856 he regularly lectured mathematical physics, in which he dealt e.g. with statics, dynamics, optics, acoustics, magnetism and electricity.

His lectures were evidently of a very high level, as during his activities the level of mathematics at the University of Prague progressed noticeably. Certainly, the main reason was that he put much emphasis on geometry and the introduction of new current topics into mathematical lectures. The second reason was his extraordinary pedagogical skills like kindness, but also exactness and strictness. Not only his pedagogical activity, but also his long-lasting function in the examining committee for candidates for secondary school teachers of mathematics demonstrates, that he took special care of education of

the new teachers generation and shows, how noticeably he influenced the level of mathematics education in the Czech countries. He participated also in the administration of the University of Prague and the Faculty of Arts, whereas he was a dean and vice dean of the professors collegium of the faculty several times.

In Prague W. Matzka won a prestigious post as a university professor, the possibility of participation in university events and a significant position in the Royal Bohemian Society of Sciences. On the other hand, his familiar situation was very oppressive. As a widowed father he cared for his three underage sons and did his best to ensure a good living and education for them. He was worried about his sons growing up without a mother. That was probably the reason he got married for the second time, very shortly after he came to Prague, in October 1850. His second, almost about twenty years younger wife Katharina Exeli (1817–1881) gave birth to their daughter Rosa in December 1852.

Since 1850 W. Matzka was a regular member of the *Königliche böhmische Gesellschaft der Wissenschaften* (the Royal Bohemian Society of Sciences). From the beginning, he was active and took part in the sessions of the society, lectured on mathematical and physical topics and published his contributions in its journals regularly. For more than 30 years (since 1852), he also acted as a cashier of this society and served this position strictly and carefully.

During the time he spent in Prague, he was also graced with a gold medal *Literis et artibus* (in science and art, 1850), and later with the honorary titles *kaiserlicher Rath* (an imperial-councilor, 1869) and *Regierungsrath* (a ministerial-councilor, 1873), which were given to public servants for their important achievements.

W. Matzka died on June 9, 1891 in Prague, almost 93 years old. He was buried at the local *Olšany* cemetery.

Scientific work of Wilhelm Matzka

W. Matzka published 68 works during more than sixty years of his scientific activity. These were published in German like textbooks, articles, historical, methodical and popular studies, either separately or in the following journals: *Abhandlungen der königlichen böhmischen Gesellschaft der Wissenschaften* (Proceedings of the Royal Bohemian Society of Sciences), *Annalen der k. k. Sternwarte in Wien* (Annals of the Observatory of Vienna), *Annalen der Physik und Chemie* (Annals of Physics and Chemistry), *Archiv der Mathematik und Physik* (Archive of Mathematics and Physics), *Astronomische Nachrichten* (Astronomical News), *Journal für die reine und angewandte Mathematik* (Journal for Pure and Applied Mathematics) und *Sitzungsberichte der königlichen böhmischen Gesellschaft der Wissenschaften* (Minutes of Assemblies of the Royal Bohemian Society of Sciences). There are 7 more manuscripts preserved up to the present days.

The spectrum of his interest was very extensive. Mostly, W. Matzka was interested in mathematics and physics. He dealt mainly with geometry and

trigonometry in mathematics. He was interested in modern themes of that time like logarithms, complex numbers and determinants, and so he stayed in touch to European mathematics. Besides mathematical and physical topics, he wrote about chronology, astronomy and geodesy. His aim was to motivate, introduce and verify the mentioned sciences by the help of mathematical methods.

W. Matzka rewrote the first two volumes of the textbook named *Vorlesungen über die Mathematik* (Lectures on mathematics) next to his common military service and teaching mathematics in the bombardier corps school in Vienna. This textbook was written in four volumes by G. Vega in the 1880s. Since that time it was published without substantial modifications several times, finally by W. Matzka during the period from 1835 to 1850 ([M3] and [M4]). He reviewed this obsolete textbook critically and improved, deepened and extended the particular details or whole sections, paragraphs and chapters. It was written as an elementary textbook for the “mathematical beginners”, even though it includes an extensive spectrum of mathematical fields. The first volume [M4] contains very detailed arithmetic, algebra and functional theory, the second volume [M3] includes geometry, trigonometry, infinitesimal calculus and the solution of differential equations. New themes and ideas were explained intuitively with the help of demonstrations, a number of practical examples and exercises (in military and in civil life). Matzka’s revision of this textbook was very good and caused that it was used successfully not only in Viennese bombardier corps school but also in other Austrian military schools in the next years.

He published an extensive monograph on chronology under the name *Chronology in ihrem ganzen Umfange, mit vorzüglicher Rücksicht auf ihre Anwendung in der Astronomie, Weltgeschichte und Urkundenlehre ... durch höhere Arithmetik begründet und erläutert* (Chronology to its full extent, with special regard to its applications in astronomy, world history and diplomatic ... established and explained with higher arithmetic) [M7] (1844), when he was active in Tarnow. He explained in detail the subject of chronology and its special terms, all on the basis of number theory, algebra and logic. He paid special attention to the Christian calendar after that, particularly to its floating holy days, and then he described e.g. calendars of Romans, Egyptians, Greeks, Jews and Arabs. He used higher mathematics, mathematical forms, arithmetical schemes and additional tables to support the chronological theory. The extent of Matzka’s *Chronology* [M7] and its strict scientific form were and are up to the present day admirable. However it was a reason, why this work was to in-depth for a practical use in history, astronomy or in civil life.

The scientific journal *Archiv der Mathematik and Physik* was established in the year 1841. The aim of its articles was to present new knowledge of mathematics, physics, mechanic, astronomy etc. in an understandable way to secondary students and teachers. Many of Matzka’s works are just mathematical and physical contributions in this journal. Only in 1840s, he published almost twenty articles, which dealt mainly with classical themes of solid geometry. From these works at least a few, such as *Berechnung des Körperinhaltes der*

Prismen (Calculation of the volume of prisms) [M12], *Nachweis der Möglichkeit oder Erzeugung eines Obelisken* (A proof of possibility to construct a truncated pyramid) [M24], *Ueber die Möglichkeit, einer Pyramidenstumpfe ein Prisma ein- oder umzuschreiben* (How to circumscribe or inscribe a prism to a truncated pyramid) [M27] and *Ueber die Berechnung der Mantelfläche jeglichen Cylinders* (About a calculation of girthed area of any cylinders) [M28], should be mentioned here. He presented some original proofs and deductions of elementary geometrical rules. These provided an inspiration for other teachers of mathematics and for talented and interested students.

The most significant works of W. Matzka arose during the time he spent in Prague. He published a monograph called *Versuch einer richtigen Lehre von der Realität der vorgeblich imaginären Grössen der Algebra ...* (An attempt of a true theory of the reality of the supposedly imaginary numbers of algebra ...) [M29] in the year 1850, in which he introduced and defended the complex numbers as well as their algebraic operations and mathematical applications. He wrote and published this work when the question of complex numbers was recent and when they became more common understanding and currency gradually. W. Matzka introduced the algebraic form of complex numbers in principles of A.-L. Cauchy and C. F. Gauss and wrote the binomial in his own way in the form $A + \downarrow B$. He described their main characteristics and the way how to calculate with them in algebraic and goniometric form; then he demonstrated many examples and expanded on the geometrical interpretation of complex numbers in an original way by the help of “broken line segments”. Further, he gave a historical summary of works (all he knew) dealing with geometrical construction of complex numbers. Especially in the connection with this list, his work [M29] was well known in the mathematical community and often reviewed (e.g. in Riecke F., *Die Rechnung mit Richtungszahlen oder die geometrische Behandlung imaginärer Grössen*, Stuttgart, 1856, Coolidge J. L., *The geometry of the complex domain*, Oxford, 1924, and Flament D., *Histoire des nombres complexes*, Paris, 2003).

W. Matzka was very interested in logarithms as well. He published three treatises and one extensive textbook to this theme and gave some lectures in sessions of the Royal Bohemian Society of Sciences. His manuscript [Mr5], which contains tables of common logarithms of goniometric functions, should be mentioned in this context. In the treatises named *Beiträge zur höheren Lehre von den Logarithmen* (Contributions to higher theory of logarithms) [M35], *Ein kritischer Nachtrag zur Geschichte der Erfindung der Logarithmen* (A critical addition to history of invention of logarithms) [M50] and *Ein Beitrag zur systemmässigen Abhandlung der natürlichen Logarithmen in der Algebra, im Geiste Nepper's und Euler's* (A contribution to the systematic treating of natural logarithms in algebra, in the sence of Nepper and Euler) [M65], he contributed by many notes and studies to the scientific and historical development of logarithms and showed hereby several methods of their approach and many historical connections. He simplified teaching logarithms by his own method in the textbook *Elementarlehre von den Logarithmen ...* (Basic theory of lo-

garithms ...) [M36]. For using this method he supposed only the knowledge of basic arithmetical operations, and so he made the logarithms accessible for primary school pupils and practical arithmeticians.

Further, W. Matzka was interested in the solution of algebraic equations of higher degrees, especially in the method of W. G. Horner, the English mathematician (the Horner scheme). In the literary-historical study called *W. G. Horner's eigentlichen Auflösungsweise algebraischer Ziffergleichungen ...* (W. G. Horner's method of solving algebraic number equations ...) [M61] published in the year 1871, he analyzed, substantiated, completed and appreciated Horner's original ideas.

W. Matzka was, similarly as the majority of the mathematician community in the Czech countries in 1870s and 1880s, fascinated by the new and modern topic of the theory of determinants. He published an original work entitled *Grundzüge der systematischen Einführung und Begründung der Lehre der Determinanten ...* (Principles of the theory of determinants ...) [M64] in the year 1877. His aim was to introduce determinants (new mathematical structures) and to derive their characteristics by means of their natural appearance in an algebraic system, stressing the common origin. After that, he presented how to use determinants to solve systems of linear equations more simply. Next to the valuable scientific part, he demonstrated the historical way of introduction of determinants, whereby his work additionally won a motivational character. This was appreciated e.g. by Hanus P. H., *An elementary treatise on the theory of determinants, a text-book for colleges*, Boston, 1886, and Muir T., *The theory of determinants in the historical order of development III*, London, 1920.

Furthermore, W. Matzka wrote brief notes and extensive treatises about geometry and spherical trigonometry. His contribution called *Zur Lehre der Parallelprojektion und der Flächen* (Theory of parallel projection and surfaces) [M63] was devoted mainly to analytical geometry based on application of determinants. In other articles (e.g. [M31] and [M34]) he demonstrated interesting deductions of basic rules (sine rule, cosine rule) of plane and spherical trigonometry.

He published two contributions on geodesy during his one-year-activity at the Prague polytechnic, namely *Berechnung der Fehler der Horizontalwinkel bei geneigter Ebene des Messtisches ...* (Calculation of horizontal angle mismatch by inclined plane ...) [M30] and *Ueber trigonometrische Höhenmessung* (On trigonometrical levelling) [M33]. He published several more or less extensive physical works as well, in the connection with his longtime lecturing on mathematical physics at the university of Prague. Next to some articles on the principles of mechanics [M10], [M37] and [M46], he wrote scientific treatises named *Allgemeine Berechnung der Stromstärke in Galvanometern* (General calculation of current in galvanometers) [M48], in which he described some generalizing possibilities of galvanometer, tangent and sinus dials, or on the calculation on diatonic scales such as *Natürlichste Berechnung musikalischer Tonleitern* (The most natural calculation of musical scales) [M69]. W. Matzka

was active in a scientific work till the high age, regardless of his serious eye disease; the last work [M69] he published when he was ninety years old.

W. Matzka influenced the level of university lectures for secondary school teachers of mathematics noticeably by his long-lasting professor career. Next to his teaching activity, he published several textbooks and scientific works including monographs, extensive treatises and brief notes. We don't find many original methods or ideas in his works, which would develop mathematics in general. He was principally interested in mathematics education, active as a professor and he paid a special attention to the university and secondary school teachers and their students. In his contributions, he presented original proofs and derivations of already known mathematical relations, rules and characteristics or showed some interesting ways of solutions of "classical problems" by the help of higher mathematics. About modern and popular themes, which were gradually included into the university and secondary school education (e.g. logarithms, complex numbers, determinants, analytical geometry), he was writing in an understandable way and provided an inspiration for his colleagues and students.

Matzka's works were well-known to other mathematicians, university and secondary school teachers already in his time. Some of them responded to his treatises and notes; others found an inspiration in his monographs. Quotations or evaluations of his works can be found in the literature (generally) about mathematics, its history and education up to the present days. His works on complex numbers [M29], logarithms [M36] and chronology [M7] are holding a meaningful position, due to their reprints in 2010, after more than 160 years, which proved their mathematical, historical and pedagogical value.

