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Jakub Filip Kulik – Life and Work

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Abstract. The aim of this article is to present some fundamental information about Jakub Filip Kulik, whose life and work is the topic of my doctoral thesis. Jakub Filip Kulik (1793–1863) was born in Lvov, he studied there at grammar school and at university. In 1814 he became a full professor of elementary mathematics at the Lyceum in Olomouc, later he was a professor of physics at the Lyceum in Steyer Graz (1816–1826) and he spent most part of his life in Prague as a professor of higher mathematics. He was also a full member of the Mathematical Class of Königliche böhmische Gesellschaft der Wissenschaften [the Royal Bohemian Society of Sciences].
In his work he dealt with number theory, especielly to creating tables of prime numbers or divisors of natural numbers. He created extensive tables of the smallest divisors for numbers in the interval 3 033 001–100 330 201, however, he didn't finish them. He also published a few textbooks.

Introduction

Several good mathematicians worked in our countries in 19$^{\text{th}}$ century. Some of them are well known, e.g. Bernard Bolzano[1], but some of them are almost forgotten, like Wilhelm Matzka[2] or Jakub Filip Kulik. In this paper I summarize information about him I found in literature.

Life, Studies, Pedagogical and Other Activities

Lvov, Olomouc, Steyer Graz

Jakub Filip Kulik was born on 20$^{\text{th}}$ April 1793 (1$^{\text{st}}$ May 1793 in our calendary) in Lvov[3] into a family of a Polish lottery official. He studied primary school called *Hauptmustervolkschule* there and after that he studied the grammar school in Lvov where he graduated in 1809.

As his father wanted him to be a lawyer he enrolled to the Lyceum in Lvov – at first philosophy (1810–1811) and then law (1812–1814). At the same time he also studied mathematics which was very interesting for him. He didn't finish law studies because in 1814 he participated in competition for the post of the professor of elementary mathematics at the Lyceum in Olomouc[4] (without foreknowledge of his parents), he won the competition and on 14$^{\text{th}}$ November 1814 he became a full professor of elementary mathematics at this lyceum. He was only 21

[1]Bernard Bolzano (1781–1848) was Bohemian mathematician, philosopher and Catholic priest. He concentrated on mathematical analysis, set theory and mathematical logic. His publication *Paradoxien des Unendlichen* influenced Georg Cantor, but he was misunderstood by his contemporaries. See also Hykšová, M.: *Karel Rychlík* (1885–1968), Edition Dějiny matematiky, Vol. 22, Prague, 2003, chapter Karel Rychlík a Bernard Bolzano, page 165–201.

[2]Wilhelm Matzka (1798–1891) was a professor of mathematics at the University of Prague and also a member of Königliche böhmische Gesellschaft der Wissenschaften. He was interested in algebra, analytic geometry, infinitesimal calculus, trigonometry and some parts of mathematical physics. See also Chocholová, M.: *Prague University Professor Wilhelm Matzka*, WDS'07 Proceedings of Contributed Papers, Part I, Prague, 2007, page 241–245.

[3]Lvov (also "Lviv", in German "Lemberg") is a city placed in Galicia. Now belongs to Ukraine but in the 19$^{\text{th}}$ century it was a part of the Austro-Hungarian Empire.

[4]The Lyceum in Olomouc was a successor of the Olomouc University which was established in 1569. In 1778 this university was moved to Brno, but in 1782 it was again established as the Moravian Lyceum.

years old! He gave his lectures in elementary mathematics in Latin seven lessons a week and he used Appeltauer's textbook.[5]

In Olomouc J. F. Kulik worked only two years and then on 24$^{\text{th}}$ October 1816 he was promoted to a professorship of physics at the Lyceum in Steyer Graz. He also obtained the doctorate from philosophy with his thesis *De phaenomenis Iridis* [About Rainbow] there. In the academic year 1822/23 he was the chancellor at this lyceum. He spent ten years of his life in Steyer Graz. At this time when he wasn't working he often travelled around Austria, Bohemia and Moravia.

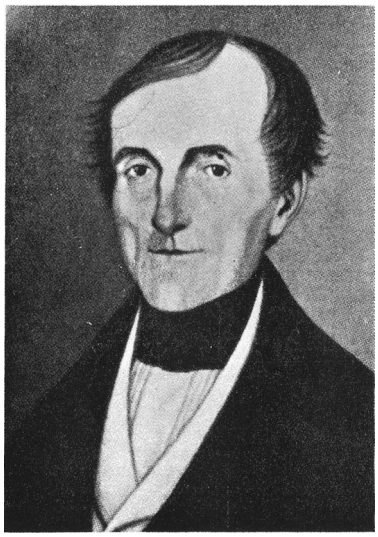

Figure 1. Jakub Filip Kulik

Prague

In 1826 J. F. Kulik came to Prague where he was appointed a professor of higher mathematics[6] at the University of Prague. There he created the biggest part of his work and he stayed there till his death.

The free lectures given by J. F. Kulik formed two-year course. In the first year there was lectured mathematics and in the second mechanics. Both these year-courses were taught three lessons a week every year. Between years 1826–1839 he used Ettingshausen's textbook,[7] later he recommended his own textbook. During Kulik's professorship at the University of Prague the number of students who attended the lectures in higher mathematics increased from about 20 to 40 in 1840s. However, there were usually only about four students of the University of

[5]Appeltauer I.: *Elementorum matheseos pureo*, Vienna and Trieste, 1814–1817.
Ignaz Appeltauer (also "Appeltaner", 1769–1829) was a professor of mathematics at the University in Vienna.

[6]There were two chairs of mathematics at the University of Prague – elementary mathematics and higher mathematics. The chair of elementary mathematics (where professor Ladislav Jandera taught and used Appeltauer's textbook) was intended for teaching the basic course of mathematics which was mandatory for students of philosophical faculty. The chair of higher mathematics provided free lectures in higher mathematics which were attended by only a few students. After the year 1848 the number of lectures in higher mathematics increased and they were taught also by Prof. W. Matzka.

[7]Ettingshausen A.: *Vorlesungen über die höhere Mathematik*, Vienna, 1827.
Andreas Freiherr von Ettingshausen (1796–1878) was a professor of physics at the University of Innsbruck and a professor of higher mathematics at the University of Vienna. He was the first who designed an electromagnetic machine for power generation with use of the electrical induction. See also *Österreichisches Biographisches Lexikon* 1815–1950, Vol. 1, Vienna, 1957.

Prague and the others were from the Prague Polytechnic. Kulik's lectures were given in German (with Polish accent), but he also spoke Latin, Polish and understood Russian.

J. F. Kulik is in memories of his students mentioned as a kind teacher who often gave his textbooks to students.

In 1829 he became a dean of the faculty of philosophy. He also became an associate (24^{th} April 1831) and later a full member (4^{th} March 1832) of the Mathematical Class of *Königliche bömische Gesselschaft der Wissenschaften* [the Royal Bohemian Society of Sciences] and was a cashier of this society. Moreover, he was a member of *Landwirtschaftsgesellschaft* [the Agricultural Society] in Styria. For his merits he was honoured by the titular *Kaiserlich Rat* [the Imperial Councillor].

In 1828 J. F. Kulik married Katharina Degl, who was a daughter of a wealthy citizen in Lvov, and they had two children. They were son Justin, who became doctor of laws, and daughter Angela, who became wife of Prof. Antonín Randa[8].

He died on 26^{th} February 1863 in Prague and was sepulchred on Košíře cemetery.

Charity and Donations

Jakub Filip Kulik was a great donator. Beside giving books to his students he was also involved in some other charity activities.

As he found 25 mistakes in Vega's *Logarithmentafeln* [the Tables of Logarithms][9] their publisher in Leipzig gave him more items of it. J. F. Kulik gave 19 of them to grammar schools in Bohemia and some other to the Viennese Academy of Sciences.

He presented every grammar school in Galicia with a collection of pictures of Greece and Egyptian antiquities in 1840. He also paid for publishing *Praktische Zeichenschule* [the Practical School of Drawing] which he to gave many schools in the whole Austrian Empire.

In revolution year 1848 Lvov was cannonaded and on 1^{st} November the library of the Lvov University was burned. As there were lost thousands of books, J. F. Kulik presented this library with 498 books in 1000 volumes. On this occasion he also gave ten huge packs of books to Galician grammar schools.

On 22^{th} July 1861 students association *Vereins für freie Vortrage aus der Mathematik und Physik* [Association for Free Lectures in Mathematics and Physics] was established. The association later developed into *Jednota českých matematiků* [the Union of Czech Mathematicians] and later into *Jednota českých matematiků a fyziků* [the Union of Czech Mathematicians and Physicists] which exists till now. J. F. Kulik entailed his own private library, which contains about 800 books, on this association, so in 1863 Kulik's library set up the base of the library of this association.

Work

The work of Jakub Filip Kulik can be divided into several groups: textbooks, applied mathematics, number theory and other mathematic texts. He also published in magazines *Zeitschrift für Physik und Mathematik*, *Abhandlungen der königlichen bömischen Gesellschaft der Wissenschaften* and *Journal für die Reine und Angewandte Mathematik*. His publications were written in German and Latin.

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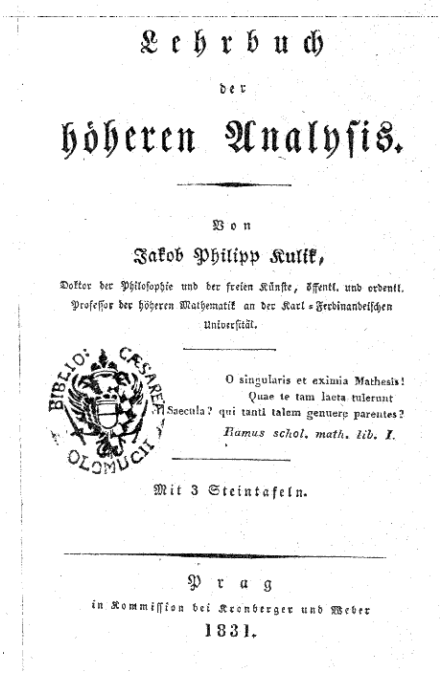
[8] Antonín Randa (1834–1914) was from 1862 an associate and from 1868 a full professor of civil law at the Prague University. In academic year 1883/4 he was a chancellor of the Czech Department of the Prague University, in 1872 and 1885 a dean of faculty of law. He got a degree honoris causa at universities at Bologna and Krakow. See also Kurková, J.: *Kdo byl JUDr. Antonín rytíř Randa?* Ad notam 2006, 3, page 91.

[9] Jurij Vega (1754–1802) was Slovene mathematician and the professor of mathematics at the Artillery School in Vienna who is known for his tables of logarithms and trigonometric functions. See also *MacTutor biography*, `http://www-groups.dcs.st-and.ac.uk/~history/Biographies/Vega.html`.

Textbooks

Kulik's best-known textbook is *Lehrbuch der höheren Analysis*[10] [Textbook of the Higher Analysis] (Prague, 1831 – the first edition, 1843 – the second edition), which he recommended for his lectures at the University of Prague. This book contains two parts: *Lehrbuch der höheren Arithmetik und Algebra* [Textbook of Higher Arithmetic and Algebra] and *Die Intergralrechnung und die analytische Geometrie* [Integral Calculus and Analytical Geometry]. There are no original results and the level of this work is comparable with Euler's compendia. The aim of this work is to explain those parts of mathematics which were needed for mechanics and physics studies.



Lehrbuch

der

höheren Analysis.

Von

Jakob Philipp Kulik,

Doktor der Philosophie und der freien Künste, öffentl. und ordentl. Professor der höheren Mathematik an der Karl-Ferdinandeischen Universität.

O singularis et eximia Mathesis!
Quae te tam laeta tulerunt
Saecula? qui tanti talem genuere parentes?
Ramus schol. math. lib. I.

Mit 3 Steintafeln.

Prag

in Kommission bei Kronberger und Weber

1831.

Figure 2. Title page of Kulik's *Lehrbuch der höheren Analysis* which is scanned from a copy housed in Scientist's Library in Olomouc.

Another Kulik's textbook called *Anfangsgründe der höheren Mechanik* [Basics of Higher Mechanics], was published in Leipzig in 1846. He wrote it from experience with twenty years of his lectures at university.

Applied Mathematics

This part of Kulik's work contains tables or manuals with a view to practical use. His book *Der tausendjährige Kalender. Ein nützliches Handbuch für Historiographen, Diplomatiker, Archivare und Richter.* [The Thousand-Year Calendar. The Necessary Manual for Historiographers, Diplomats, Archivists and Judges.] (Prague – 1831 and 1843, also 1861 under different name) contains an universal calender for years 400–2366. We can find there Christian calender (Julian and Gregorian) and also Jewish and Turkish calender for these years.

Some other books from this part of his work are e.g. *Tafeln zur Bestimmung des Inhalts cylindrischen und conischer Gefässe in Bierbrauereien und Branntweinbrennerien* [The Tables for Determination the Capacity of Cylindrical and Conical Dishes in Brewing Industry and

[10] *Lehrbuch der höheren Analysis*, the first edition, which is scanned from the exemplar placed in New York Public Library, is now free available on Google Books:
`http://books.google.com/books?id=ZQcAAAAAMAAJ&printsec=titlepage&hl=en`

Distillery] (Lvov – 1836) and *Anfangsgründe der höheren Mathematik mit Rücksicht auf ihre technischen Anwendungen* [Basics of Higher Mechanics With a View to Their Technical Use] (Leipzig – 1844–1846).

Number Theory

The biggest part of Kulik's work was concentrated on the number theory, especially on finding prime numbers and divisors of natural numbers. He also attempted to find a method of graphical determining prime numbers, but he wasn't successful. He only stated that the scheme shows some deeper rule.

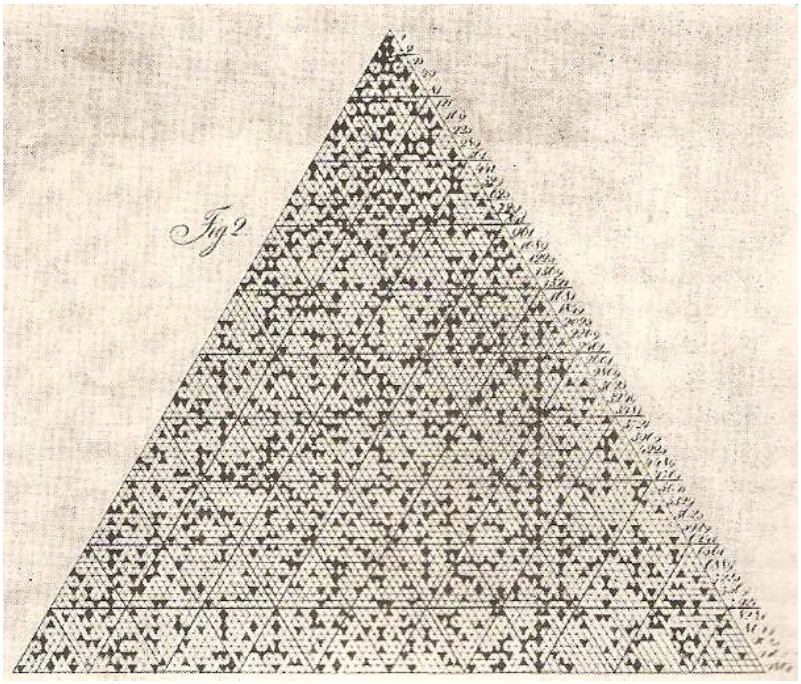


Figure 3. Kulik's unique attempt to find a method of graphical determining prime numbers.

In the end of 18$^{\text{th}}$ and in the first half of 19$^{\text{th}}$ century several mathematicians tried to create tables of prime numbers of divisors and they gradually published tables up to 7$^{\text{th}}$ million. But the tables of 11$^{\text{th}}$ million were at first printed only in 1951.[11]

Firstly J. F. Kulik published the tables of the first million called *Divisores numerorum decies centena milia non excedentium* [Tables of Prime Divisors of All Numbers up to One Million] (1825 – Steyer Graz). This work contains all prime divisors for numbers between 1 and 21 516 (without numbers divisible by 2, 3, 5 and 11). For numbers in the interval 21 500–1 000 000 there are recorded only the smallest divisors. He also outlined simple procedures of determining the smallest divisor for bigger numbers in this tables.

His other tables *Tafeln der Quadrat- und Kubikzahlen aller natürlichen Zahlen bis Hunderttausend* [Tables of the Squares and Cubics of All Natural Numbers up to Hundred Thousand] were published in Leipzig in 1848.

The top of his work is the extensive manuscript called *Magnus canon divisorum pro omnibus numeris per 2, 3 et 5 non divisibilibus et numerorum primorum interjacentium ad Milies centena milia accuratius ad 100 330 201.* The aim of this work was to create tables of the smallest divisors of numbers in the interval 3 033 001–100 330 201 indivisible by 2, 3 and 5. Although J. F. Kulik wrote it in Prague this work is deposited in the Viennese Academy of Sciences,

[11] Kulik, Poletti, Porter: *Liste des nombres premiers du onzième million*, Amsterdam, 1951.

because he wanted it to be transported there after his death, so that other scientists could study it. The manuscript is written on 4212 pages of format 30 by 37 cm and is divided into 8 volumes. The second volume has been lost (probably during the transport from Prague to Vienna).

Every page is divided by 80 lines (which determine units and tens) and 77 columns (which determine higher orders) into frames. Every frame represents a number and there is entered the smallest divisor of this number. As there are only numbers indivisible by 2, 3 and 5, every page represents the interval 23 100.

J. F. Kulik created a special space-saving format for recording numbers. He used letters for representing pairs of digits, e.g. $a1 = 101$, $r9 = 269$ (this system was used also in *Divisores numerorum decies...*). He also used space-saving format for recording the divisors. If there is written 7, it means that the smallest divisor is seven, but prime numbers between 11 and 109 are represented by Latin alphabet, prime numbers between 113 and 163 are represented by digits 1, 2, 3, 4, 5, 6, 8, 9 and higher prime numbers are represented by pairs of letters.

This work represents twenty years of Kulik's work, but it is not finished. The first volume seems to be complete, but from the third one the tables are incomplete (high prime numbers are not recorded).

The inheritance in Vienna also contains auxiliary calculations and tables, calculations of circular functions etc.

Conclusion

Although Jakub Filip Kulik didn't finish his greatest work he was a very important person of our mathematic community in the 19$^{\text{th}}$ century. This mensions shows only basic data about his life and work. The aim of my research is to map his life and explore and create the detailed summary of his work. I hope I will prove his importance and his contribution for our mathematics.

Acknowledgments. The author thanks doc. RNDr. Martina Bečvářová, Ph.D., for her professional help with the dissertation.

References

Bečvářová M.: *Česká matematická komunita v letech 1848 až 1918*, Edition Dějiny matematiky, Vol. 34, Prague, 2008.

Navaříková L.: *Historie matematiky na olomoucké univerzitě*, website: `http://navarikp.sweb.cz`.

Nový L. et al.: *Dějiny exaktních věd v českých zemích do konce 19. století*, Prague, 1961.

Nový L.: *On Kulik's Tables of Divisors*, Acta Hist. Rerum Nat. necnon Tech. Special Issue 16, Prague, 1981, p. 327–343.

Porubský Š.: *Jakob Philipp Kulik – ein vergessener Rechenkünstler*, Tagung zur Geschichte der Mathematik, Augsburg, 2004, p. 307–328.

Würzbach C. von: *Biographisches Lexikon des Kaiserthum Oesterreich*, 13$^{\text{th}}$ volume, Vienna, 1865, p. 356–358.