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Hungarian Mathematics Development Stimuli

Abstract. The article aims to show that the *KöMaL* high school journal was one of the most significant factors in the development of Hungarian mathematics. The understanding of the importance of education by the Hungarian nobility, the Austro-Hungarian Compromise and *Mintagimnázium* all played a key role.

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Key words and phrases: Hungarian mathematics; Hungarian nobility.

1. Introduction. In the article we mention many prominent scientists, especially mathematicians, but we will provide more detailed facts only on some. The reason is that there are many professional articles written on each of them, including at least one book. In these, the reader will find detailed personal and professional biographies. For each chapter we will present the basic literature sources that we used.

2. A brief overview of higher education. Although the universities in the Kingdom of Hungary were founded a long time ago, they lasted only a few years, at most for decades. Thus, quality education could only be obtained at foreign universities and those who returned did not find an environment at home suitable for their activities. For this reason, the real history of mathematics "cultivation" in Hungary began very late, at the beginning of the 19th, century, but more significantly only in its last third after the Austro-Hungarian Compromise. This is well illustrated by the brief history of higher education in Hungary.

The first University of Hungary was established in Pécs by Louis I of Hungary in 1367. The university existed for a few decades only.

The second University of Hungary was established by Sigismund of Luxembourg (1368–1437) in Óbuda in 1395. This university worked for no more than 15 years.

The third University of Hungary – Academia Istropolitana – was established in *Pressburg* (Istropolis by the Ancient Greek name, the name Bratislava originated in 1920) King Hunyadi Mátyás [Matthias

Corvinus] (1443 – 1490) in 1467. Esztergom Archbishop János Vitéz was a great supporter and organizer of the University. After his death in 1472, however, the University began to decline, famous teachers left, and teaching officially ended after Matthias Corvinus's death. After that, university teaching did not exist in Pressburg for several centuries.

The still working *Eötvös Loránd Tudományegyetem* in Budapest, official abbreviation ELTE, was established in 1635 by Esztergom Archbishop Péter Pázmány in Nagyszombat (today Trnava, Slovakia). In 1777 the University was moved to the royal castle in the city of Buda. A number of today's independent universities have evolved from this institution. In 1784 the university moved to the left bank of the Danube to the city of Pest. The name Budapest was introduced in 1873, so until 1873 the University was named Royal University of Pest, then the University of Budapest until 1921. Until 1844, the language of instruction was Latin as a neutral language of the monarchy's nations. After the Austro-Hungarian Compromise of 1867, the era of the University's greatest development began. At the turn of the 19th and 20th centuries, it was among the 15 largest universities in the world according to the number of students, since there were only two classical universities in the then Hungary before 1914.

Magyar Királyi Ferenc József Tudományegyetem [Royal Hungarian Franz Joseph University] was the second modern university in the Hungarian realm of the Austro-Hungarian Empire. Founded in 1872, its seat was initially Kolozsvár (today Cluj-Napoca, Romania). In the autumn of 1918, the Romanian forces began to occupy the Hungarian territories. Therefore after World War I, the University first moved from Kolozsvár to Budapest for a brief period (1919–21), and later found temporary housing in Szeged (1921–40). After a temporary return to Kolozsvár in 1940–1945 and another move back to Hungary after World War II, the University has been based in Szeged since then. The University in Kolozsvár was an important center of science and education in the Austro-Hungarian Monarchy (v. [15]). It was probably best known for its leading role in mathematics, earning him the name "Göttingen of the Monarchy". (The university attracted mathematicians such as Gyula Farkas, Lipót Fejér, Alfréd Haar, Frigyes Riesz, Ludwig Schlesinger, Gyula Szőkefalvi-Nagy and Gyula Vályi.)

Emperor Joseph II establishes the Institutum Geometrico-Hydrotechnicum as part of the Faculty of Liberal Arts at the University of Buda in 1782. The Institutum is a direct predecessor of today working Budapesti Műszaki és Gazdaságtudományi Egyetem [Budapest University

of Technology and Economics], (or shortly Műegyetem, official abbreviation BME), and is the first in Europe to award engineering degrees to students of land surveying, river control, and road construction. BME is the most significant university of technology in Hungary and is considered the world's oldest institute of technology which has university rank and structure. It was the first institute in Europe to train engineers at university level.

At that time, Institutum Geometrico–Hydrotechnicum taught intermediate-level technical sciences in preparation for engineering studies. The main subject was applied mathematics, which included teaching on land surveying and hydraulic engineering. However, the rapid development of industry required increasingly better knowledge. The Hungarian Parliament (National Assembly) requested the establishment of an independent technical university in 1836, but did not receive a substantive answer. Therefore, those who decided to pursue an engineering career still studied in Vienna for some time. In 1856, teaching began to differentiate basically into three groups: general, mechanical and chemical engineering. In 1860, Hungarian (succeeding German) became the language of instruction, and the name Királyi József Műegyetem was used instead of Polytechnikum. On 10 July 1871, four years after the Compromise, Emperor Franz Josef Franz Joseph approved the organizational rules of the University.

The Academy of Mining and Forestry was established in Selmecbánya (today Banská Štiavnica, Slovakia) in 1735. On 13 December 1762 Maria Theresa established Bergschule ("Berg Schola") with a formal academy status in order to train specialists in silver and gold mining and metallurgy for mines in the surrounding area and the whole country. It is the world's first institution of technology or technical university with tertiary technical education. Many members of the first teaching staff at BME arrived from Selmecbánya.

Literature reference to this chapter: [12], [16], [15], [Sö1], [Sö2].

3. No tradition, just two lights in the darkness. Farkas Bolyai (1775 – 1856) studied in Göttingen in 1796 – 1799. In 1832, he published the textbook *Tentamen* that includes also his widely known assertion: *"If two planar polygons have the same area, both can be cut into polygons that are identical in pairs."*. This seemingly simple assertion is not as trivial as it seems at first glance, and no one had long been able to find out whether an analogous assertion also applies to a 3-dimensional space. Therefore, Hilbert put this problem on his famous list as problem number 3 in 1900. However, as early as in 1900 Max Dehn (1878 – 1952)

proved that an analogous assertion does not apply to the 3rd dimension.

János Bolyai (1802 – 1860) studied at the Military Academy in Vienna, as he did not have the money to study in Göttingen. As early as in 1823, János wrote to his father in a letter that "I have created another world, a new world from nothing", by which he meant non-Euclidean geometry. This was three years before Lobachevsky gave his first lecture on the issue. However, Bolyai published the results of his 1823 research no earlier than in 1832 as an Appendix in his father's book *Tentamen iuventutem studiosam in elementa matheseos ... introducendi* in Marosvásárhely. But this was already 3 years after Lobachevsky's (1792 – 1856) French article *Geometry imaginaire*. The truth, however, is that *Congrès international de bibliographie des sciences mathématiques* Secretariat led by Poincaré introduced the official title *Géométrie de Bolyai et Lobatschewsky*.

Please note that there was no mathematical research in the Kingdom of Hungary before the Bolyais.

Literature reference to this chapter: [7, 9, 11, 12, 16].

4. Emergence of a tradition. The teaching of mathematics began to reach the desired level only with the next generation: Jenő Hunyady (1838 – 1889), Ágoston Scholtz (1844 – 1916), Mór Réthy (1846 – 1925), Gyula Farkas (1847 – 1930), Gyula Kőnig (1849 – 1913), Lipót Klug (1854 – 1945), Gyula Vályi (1855 – 1913), Manó Beke (1862 – 1946), Gusztáv Rados (1862 – 1942), Lajos Schlesinger (1864 – 1933), József Kürschák (1864 – 1933), and many others.

This generation almost without exception studied abroad at the Universities of Vienna, Berlin, Munich, Karlsruhe, Heidelberg, Paris, Göttingen, etc. They also established themselves scientifically and, when they returned home, they taught as professors at the Universities of Kolozsvár (Réthy, Klug, Farkas, Vályi, Schlesinger), in Budapest (Scholtz), and at Technical University in Budapest (Hunyady, Gy. Kőnig, Beke, Rados, Kürschák). Their return home after studying abroad was also strongly supported by the Austro-Hungarian Compromise in 1867, as a result of which the financing of the education system has also improved considerably. A very important factor stimulating the return of educated people was the change in the view of the Hungarian nobility on the importance of education, which was reflected in, for example, the construction of the magnificent building of the Hungarian Academy of Sciences in 1862 – 1865.[1]

[1]Count István Széchenyi offered a one-year return on all his property for the construction of the building of Academy. Other rich donors and a very successful

Literature reference to this chapter: [4, 8, 15, 25, 32, 31, 34].

5. Mintagimnázium as a path to quality

An important step towards the education of quality secondary school teachers was taken in 1872. In 1869, the then Minister of Education, Baron József Eötvös,[2] sent Mór Kármán (1843 – 1915) to study pedagogy in Leipzig. After returning home in the autumn of 1871, Mór Kármán[3] became a professor of languages (Hungarian, Latin, Greek, German), psychology and pedagogy at the University of Budapest and came up with the idea to create such a grammar school, where 5th year students would go to watch the model lessons of the best teachers and, under their guidance, teach something to yourself. Hence the name *Mintagimnázium*, i. e. a *Model Grammar School*. And since he based this idea on specific organizational rules, Tivadar Pauler – the successor of Baron József Eötvös in the chair of the Minister of Education – accepted his idea. At that time, it was the first school of its kind in the world. Kármán was the pedagogical leader of *Mintagimnázium* until 1899.[4] Significant students from this grammar school included Mór's son Tódor (known as Theodor von Kármán), Dénes Kőnig, Mihály Polányi, Ede Teller, Tamás Balogh, Miklós Káldor and many others. The method and quality of teaching at this grammar school left such a strong impression on Emperor Franz Joseph that he entrusted Mór Kármán with the teaching of his nephew, Archduke Albrecht, and promoted Mór Kármán to a noble status. His son Tódor then used this noble as well.

In the book by J. A. Lukacs [21]: *Budapest 1900. A Historical Portrait of a City and Its Culture*, New York: Weidenfeld & Nicolson, 1988, the author states that teachers at secondary schools in Budapest at the turn of the century were more professionally erudite than heads of departments at US universities. We support the weight of these words with a very short biography of the author, who wrote more than 30 books.

nationwide fundraising then secured the construction of a beautiful Neo-Renaissance building.

[2]Baron József Eötvös (1813-1871) did an enormous amount of work to raise the level of education of the masses. When he became Minister of Education for the second time in February 1867, he enforced the law on general and compulsory education of the people, as well as the law on the equal rights of Jews. His son, Baron Loránd Eötvös, became a well-known physicist for extremely accurate measurements of up to 9 decimal places.

[3]The famous 1881 Munkácsy painting entitled "Christ in front of Pilate" features a depiction of Christ in which many recognized Mór Kármán. However, he was extremely humble man and objected as follows: "Christ has been a role model for me for a long time, but I would never have believed that I would be his model."

[4]Manó Beke also taught mathematics there between 1895 and 1900.

John Adalbert Lukacs (1924 – 2019) was born in Budapest, where he studied history at the University. In 1944 he was doing forced labor. He managed to escape and was successfully hiding until the end of the war. (But he never saw his parents again.) In 1946, it became clear that Hungary would belong to the Soviet sphere of influence, so he emigrated through Austria to the United States. From 1947 until his retirement in 1994, he taught in the Department of History at Chestnut Hill College in Pennsylvania, and until 1974 he headed that department. In the meantime, he has been a visiting professor at many important universities, e. g. University of Columbia, Princeton, Johns Hopkins. He died in the USA.

Literature reference to this chapter: [13, 14, 26].

6. *KöMaL*, Arany, Rátz

Dániel Arany (1863 – 1944) graduated from the University of Budapest, and then worked as an assistant at the Forestry Academy of Selmecbánya. He worked as a secondary school professor in Győr between 1893 and 1896. Following the example of the journal *Mathematikai Lapok* published by the Mathematical and Physical Society, he published a tentative issue of a secondary school journal entitled *Középiskolai Mathematikai Lapok* (*KöMaL*) on 1 December 1893. From 1894, he began publishing it regularly with the aim of "putting a content-rich collection of examples in the hands of both pupils and mathematics teachers." In 1896, Arany moved to teach to Budapest and László Rátz took over the publishing of the journal. Arany wrote several high-profile secondary school textbooks, as well as articles on insurance, Simson line, and probability theory. He died together with his wife in a ghetto in December 1944 during an onslaught on Budapest. Before leaving for the ghetto, Arany managed to donate his large and very valuable library to the Society.

László Rátz (1863 – 1930) studied at the University of Budapest between 1883 and 1987. He interrupted his studies after completing 4 years. Then he spent a year from 8 October 1887 to 7 August 1888 at Berlin University, and continued another year in Strasburg, studying natural sciences from 31 October 1888. Rátz spent a year from September 1889 as an adept of teaching at *Mintagimnázium*. After passing pedagogical and professional examinations, he obtained a diploma as a teacher of mathematics and physics in November 1890.

From 1 September 1890, Rátz taught at the Main Evangelical Grammar School of the Augsburg Confession in Budapest as a deputy professor and from 1 September 1892 as a full professor. This school moved

to a new building in the city district of Városligeti fasor in 1904 and became well known and famous under the name *Fasori gimnázium*.[5] In 1909, Rátz was elected Director of this grammar school. Although the term of office of a director was 6 years, Rátz resigned after 5 years. He caused a general surprise, as the teaching staff as well as the superiors were extremely satisfied with his management. However, Rátz only wanted to devote himself fully to teaching and, in his own words, the position of Director took too much energy from him. His co-workers characterized the situation in such a way that Rátz ceased to be Director, but he still remained their leader, because his opinion had long been decisive in matters of teaching. It manifested, among other things, in the fact that after his abdication he was appointed lifelong honorary director of the grammar school.

Rátz was extremely versatile. As a tourist, he visited the Norwegian Fjords and also crossed the glaciers in the Bernina Pass, led the grammar school's singing and musical ensemble for more than 15 years, and organized trips with his students. He was available to all his students virtually at any time, but he devoted his time especially to exceptionally gifted students with great dedication. He had the ability to recognize children's talent: he gave Neumann extra hours (for which he did not take money from Neumann's father, who was a banker), he lent Wigner math books, the contents of which they then discussed in detail at the next meeting. When Wigner and Neumann were already in higher years of secondary school, Rátz often invited them to a café on Saturday afternoon, where they had a coffee in the company of university professors (Beke, Szegő, Fekete), which was a particularly great honor for young students.

The issue of modernizing teaching methods became topical in Hungary as a result of Europe-wide efforts to achieve a unified science education platform at the turn of the century. Many of the foremost mathematicians of the time were involved in creating new secondary school curricula and did a lot of work, for example Henri Poincaré and Felix Klein. In 1906, therefore, a reform commission for mathematics was elected in Hungary as well, chaired by university Professor Manó Beke, Rátz's secondary school colleague, physicist Sándor Mikola (1871 – 1945) was Secretary, and László Rátz became the third member of the commission. Later, it turned out that Rátz had done a huge amount of work,

[5] Other famous professors also taught at that school: Sándor Mikola, János Renner and Ödön Hittrich, who in 2002, together with L. Rátz, became part of the Hungarian cultural heritage.



Figure 1: Wigner's work room. Rátz's photo is on the wall in the middle.

because the curricula that he had developed and used at his school since the early 1900s were approved and used. In 1910, the French Ministère de l'Instruction publique et des Beaux-arts awarded him the title *Officier d'Académie*.

The inclusion of differential and integral calculus in secondary school curricula was also extremely important for the teaching of physics, because it was possible to work much more accurately and effectively with the concepts of speed, acceleration, potential, etc. That is why the textbook was written, entitled "L. Rátz, S. Mikola: *Az infinitezimális számítás elemei a középiskolában*" [Elements of infinitesimal calculus on high school], 1st issue: Franklin Társulat, Budapest 1910; 2nd issue: Franklin Társulat, Budapest 1914.

Rátz became the legendary secondary school professor at the famous *Fasori gimnázium* already during his life. There, he taught such personalities as Alfréd Haar, János Neumann, Jenő Wigner, and many others. This is how Wigner put it, but all Rátz's students issued similar statements: "*Fasori gimnázium* was probably the best school in Hungary and certainly one of the best in the world. While Western schools taught separate knowledge, in my high school knowledge of individual subjects was strongly intertwined. Our teachers were extremely erudite and taught with incredible enthusiasm. And the best teacher ever who taught me was László Rátz, whose picture I still have in front of me in my office." In honor of Professor Rátz, the *Rátz Tanár Úr Életműdíj* Prize was established in 2001, which is be awarded each year to two secondary school professors in each of the four fields: mathematics, physics, chemistry and biology.

Rátz suffered a stroke on the way from Karlovy Vary at the be-

ginning of September 1930. He died in a sanatorium in Budapest on 30 September 1930.

We mentioned above that in 1896 Arany began teaching in Budapest and the publication of *KöMaL* journal was taken over by Rátz, who was already the most respected secondary school professor at the time. There is no evidence of why the exchange took place at any of the schools where the two taught. There is no written document about this even in the state archives of Hungary. It is therefore very likely that this exchange took place only on the basis of an oral agreement through someone from the Board of Directors of the Society. But in 1896, Rátz's proposals for changes in the structure of the journal appeared, together with his thanks to Arany, were featured in the first issue under Rátz's management. Also featured was Arany's statement that he was convinced the journal would continue to fulfill the main goal with which it was founded.[6] At Rátz's request, Arany continued as the journal's chief contributor.[7] Rátz edited *KöMaL* journal until 1914, devoting to it an enormous amount of time and a lot of his own money.

In 1914, the *KöMaL* journal ceased to exist. It was restored in 1925 by Andor Faragó (1877 – 1944), who had previously worked with Rátz.[8] However, Rátz no longer joined this renewed journal. This 2nd period of *KöMaL* lasted until 1938, when the journal ceased to exist due to lack of paper. It was restored again in 1947 by János Surányi (1918 – 2006), so the journal is experiencing its 3rd period of existence and maintains a very high standard. Since 1959, the journal has had a part on physics, and since 2001 also a part on informatics, but it is still published under the abbreviation *KöMaL*.

Arany's idea, Rátz's work, and then the work of their followers had an invaluable significance, and also a long-term impact – there were even mentions of the so-called Hungarian mathematical and scientific miracle. A large number of future top mathematicians, physicists, natural scientists and engineers took part in solving the listed problems, and many of them expressed the view that *KöMaL* had taught them to

[6] Rátz fulfilled Arany's goal of publishing a quality collection of problems. He published excellent elaborate problems from the first 10 years of *KöMaL*, namely Algebra in 1904 and Geometry in 1905: L. Rátz, *a Mathematikai Gyakorlókönyv*, A Középiskolai Matematikai Lapok tíz évfolyamában megjelent feladatok gyűjteménye, [Collection of model problems published in the first 10 years of *KöMaL*] I. kötet: Algebra, Franklin Társulat, Budapest 1904; II. kötet: Geometria, Franklin Társulat, Budapest 1905.

[7] Antal Márk (1880 – 1942) also took part in this work between 1907 and 1914.

[8] Faragó introduced the publication of photographs of excellent researchers. These can be found at https://www.komal.hu/tablok/.

think and if there were no *KöMaL*, they would certainly do something different in life. Based on the list below, we would like to add that it would be a pity for world science.

An abbreviated list of the most significant *KöMaL* task solvers before WWI: Lipót Fejér (1880 – 1959), Frigyes Riesz (1880 – 1956), Tódor Kármán (1881 – 1963), Dénes Kőnig (1884 – 1944),[9] Alfréd Haar (1885 – 1933), Gábor Szegő (1895 – 1985), Tibor Radó (1895 – 1967), Marcel Riesz (1886 – 1969), László Rédei (1900 – 1981), Jenő Wigner (1902 – 1995), János Neumann (1903 – 1957).[10]

The most successful task solvers of the 2nd phase, the so-called interwar period, included: László Kalmár (1905 – 1976), Ferenc Kárteszi (1907 – 1989), Ede Teller (1908 – 2003),[11] Pál Turán (1910 – 1976), György Szekeres (1911 – 2005),[12] Tibor Gallai (1912 – 1992), György Hajós (1912 – 1972), Pál Erdős (1913 – 1995),[13] Béla Szőkefalvi-Nagy (1913 – 1998), László Fejes Tóth (1915 – 2005), Endre Vázsonyi (1916 – 2003), Tibor Szele (1918 – 1955), János Surányi (1919 – 2006), Imre Lakatos (Lipschitz) (1922 – 1974), János Harsányi (1920 – 2000), Endre Hódi (1923 – 2003).

Among the most successful researchers after WWII, i. e. the 3rd (still ongoing) period, we will list only some of the names from the beginning of the exclusive, very long list: Sándor Kántor, Gyula Katona, András Sárközy, Emil Molnár, Lajos Pósa, Miklós Simonovits, József Pelikán, László Lovász, András Simonovits, László Babai, and an enormous number of other extremely famous names even after 1965. We ended our list with this year, even though many of the younger generation are already holders of the most prestigious awards.[14]

Selected literature reference to this chapter: [3, 2, 5, 6, 9, 10, 12, 16, 18, 19, 20, 24, 27, 30, 28, 33].

7. The Martians. Tódor Kármán (1881 – 1963)–*Swirling flow*

[9] Author of the first monograph on Graph Theory.

[10] Neither Wigner nor Neumann could win the graduates competition, because it did not take place between 1919 and 1921.

[11] Hydrogen bomb creator.

[12] Chemical engineer, together with Erdős the co-author of the renowned combinatorial theorem from 1935, also known as the "Happy End Problem".

[13] One of the greatest mathematicians of all time, author of over 1 500 scientific works.

[14] The first year of 1894 was won by Mihály Seidner from Lučenec. Successful problem solvers of the *KöMaL* competition also included a pupil from Prague and many pupils from all over the then territory of Hungary: Prešov, Levoča, Lučenec, Nitra, Nové Zámky, Beregsász [Beregovo], Novi Sad, Arad, Nagyvárad [Oradea], Temešvár, etc.

theory, György Hevesy, (1885-1966) [George de Hevesy]–*Nobel Prize (Chemistry)*, Marcel Riesz (1886 – 1969)–*Calculus*, Mihály Fekete (1886 – 1957)–*Transfinite diameter*, György Pólya (1887 – 1985)–*Calculus*, Mihály Polányi (1891 – 1976) [Michael Polanyi]–*Plastic deformation, Economics. Michaels' son János Polányi, as a Hungarian-Canadian scientist was awarded the Nobel Prize in Chemistry in 1986.*, Kornél Lánczos (1893 – 1974)–*Lánczos algorithm for eigenvalues of large matrices*, Gábor Szegő (1895 – 1985)–*Calculus*, Tibor Radó (1895 – 1967)–*Geometry*, Leó Szilárd (1898 – 1964),[15] Gábor Dénes (1900 – 1979) [Dennis Gabor],[16] Jenő Wigner (1902 – 1995),[17] Ábrahám Wald (1902 – 1950),[18] Egon Orován (1902 – 1989),[19] Aurél Wintner (1903 – 1958),[20] János Neumann (1903 – 1957),[21] Péter Károly Goldmark (1906 – 1977),[22] Pál Halmos (1916 – 2006),[23] Edward Teller (1908 – 2003),[24] János Harsányi (1920 – 2000),[25] János György Kemény (1926 – 1992),[26] Péter Lax (born 1926),[27], etc.

This is a very important group of scientists who (with few exceptions) started their studies in Hungary, at one of the great grammar schools in Budapest *(Fasori gimnázium, Mintagimnázium, Piarista gimnázium, Berzsenyi Dániel gimnázium, Szent István gimnázium, ...)*, but then they spent the whole active life abroad, and eventually returned home at the end of their lives. These were not only mathematicians but also other scientists who formed the global history of the 20th century outside Hungary. Most of them belonged to a group called *The Martians*.[28] The reasons for this emigration can be found in the political

[15] Chain reaction, and many others.

[16] Nobel Prize (Holography).

[17] Nobel Prize (Physics).

[18] Statistics.

[19] Plastic deformation, Krypton extraction.

[20] Probabilistic number theory.

[21] John von Neumann is perhaps the most influential of all Hungarian mathematicians. His work ranges across numerous fields of mathematics, as well as economy, physics and computer science. According to many scientists, von Neumann certainly deserved the Nobel Prize in Physics, but he died too soon to be awarded it. But if the Nobel Prize were also awarded for mathematics and computer sciences, he would have at least three Prizes.

[22] Color television, LP-phonograph.

[23] Measure theory.

[24] Hydrogen bomb.

[25] Nobel Prize (Economics), also game theory.

[26] BASIC.

[27] Various fields (Abel Prize).

[28] *The Martians* was a term used to refer to a group of prominent Hungarian scientists (mostly, but not exclusively, physicists and mathematicians) who emigrated

order and economic situation after WWI, with many scientists basically fleeing Hitler.

From this incomplete list, the reader can form a picture of the amazing scientific power launched almost without exception by *KöMaL* and Budapest (and Debrecen, Győr, Miskolc, Pécs, Szeged, ...) Grammar Schools.

Selected literature reference to this chapter: [1, 17, 22, 23, 29].

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Węgierskie bodźce do rozwoju matematyki.

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Streszczenie. Artykuł ma na celu wykazanie, że dziennik licealny *KöMaL* był jednym z najważniejszych czynników rozwoju matematyki węgierskiej. Kluczową rolę odegrało zrozumienie znaczenia edukacji przez węgierską szlachtę, kompromis austro-węgierski oraz *Mintagimnáziu*.

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