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*To Antanas at the occasion of his 65th birthday
in admiration for his contribution
in expanding Lerch's heritage*

Abstract. We describe the life and career of Matyàš Lerch, one of the
most prominent Czech mathematician on the turn of 19th and 20th century. We give a short family background, proceeding to his studies at the
Prague Polytechnic, his assistantship years there, forced departure to Swiss
Fribourg, and return back to Bohemia.

Key words and phrases: Gabriel Blažek, Charles Hermite, Matyàš Lerch,
Prague Polytechnic, František Josef Studnička, Eduard Weyr, Emil Weyr,
University of Brno, University of Fribourg.

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Mathematicians are born, not made. *H. Poincaré*

Mathias Lerch (in Czech Matyáš[1] Lerch) is a well-known Czech mathematician. Lerch is one of two Czech mathematicians which name appears in Mathematics Subject Classification, namely in the form of the Lerch zeta function. Lerch published 238 papers, predominatingly on mathematical

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[1]According to his birth certificate, his first name was Matěj (=Matthew), a fact which is often a surprise, because he used the form Matyáš from the very beginning also in his papers in Czech. This name is also used on his headstone.

analysis and number theory. From these he wrote 110 within 10 years at the beginning of his carrier.

Matyáš Lerch was born on 20 February 1860 from poor parents in a small village named Milínov in South Bohemia (78 km south-west of Prague)[2]. When he was six years old, in the time when the others children of his age started the compulsory primary schooling[3], Lerch has suffered a severe injury on the left leg, resulting in a lifetime handicap; in order to walk he needed crutches and later, after some improvements, a stick. He started to visit the elementary school only as nine year old boy for this injury prevented previously to attend regular school. Fortunately enough, the smart boy uselessly spending the time on the fields and meadows behind the town borders was noticed by the later burgomaster O. Tichý of Sušice, a small town at the foot of the Bohemian Forest, where the Lerch family moved around 1868, who managed that Matyáš started regularly to visit the elementary school.

Lerch later often mentioned the math class episode from the elementary school when he pointed out a slip in a teacher's solution of a problem on the blackboard. The episode made waves in the town.

When in 1877 Lerch completed the compulsory basic education, the teachers urged him and his parents to continue to study on a secondary school,

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[2]Parents Vojtěch and Barbora Lerch had five children, two sons and three daughters. The first two children soon died. The eldest son Vojtěch died as a quite young child and the second child – daughter Marie – died tragically at the age of three or four years. She drowned in a water tank on a farm, where her father worked as a rector. The remaining three children, Matyáš, Ružena and again Marie, lived to adulthood.

[3]Let us mention that in the Habsburg Empire the compulsory education of six years was established by law in 1774 and enlarged by two additional years to eight by a radical and progressive education reform started by the "Reichsschulgesetz" in 1869. According to this law, the school system started with a compulsory basic education in a five-years elementary (folk) school followed by a three-years non-selective lower secondary burgher schools "Bürgerschulen" for children aged between 11 and 15, financed by local authorities. A possible further continuation were the higher secondary schools of a type called gymnasium (classical secondary school) or the second type called "Realgymnasium" or "Realschule". The latter one was a non-classical commercially oriented secondary school. Having a special position among the schools of the gymnasium type, it was a school intended to prepare its pupils for industry, business or for further study on technical universities. On the highest educational level stood universities and technical universities (often called polytechnics at that time).

It is interesting to note [4] that, according to the official Austro-Hungarian statistics, the degree of literacy among the Czechs was extraordinarily high. In Bohemia, in 1900, only 2.6 per cent of the Czech adult population was illiterate, compared with 3.5 per cent of the German population. The illiteracy rate of the adult population of March of Moravia and Austrian Silesia (forming the remaining parts of the historical Kingdom of Bohemia, which territory is almost identical with today's Czech republic) was only one point higher.

but the parents decided that he will learn for a tailor. Their income was too low for a family of five and they saw no possibility to support his further studies in addition outside the town. Coincidentally, immediately after the end of the school year František Scheinhost, the owner of the match factory[4] in Sušice, who also supported the school financially, offered the perceptive reckoner Lerch a clerk position in his factory. This was one of the determining moments in Lerch's career. He actually began to work in the office of Scheinhost's factory, but before the end of the regular summer school holidays in 1877, he decided to continue to study even though he knew that it meant not only spending the time over the books and devote it to learning but also to make his living by tutoring. Already at that time he had mathematics in mind as his future source of his livelihood.

> The mind is not a vessel to be filled, but a fire to be kindled. *Plutarch*

It is necessary to mention that Lerch had a special heartfelt relation to his math teacher Emil Seifert from the burgher school in Sušice. E. Seifert was only four years older than Lerch. It was probably this small age difference between them, which made that the teacher-pupil relationship developed rather friendly in nature, and not a formally, liaison between both. Inevitable combination of extraordinary abilities of Lerch and Seifert's great expertise undoubtedly played a role in these relation. It is out of question that it was E. Seifert who played the paramount role at the cradle of Lerch's mathematical orientation[5]. Seifert not only opened him the gates into the world of mathematics but also he gave him the rudiments of French language.

Emil Seifert finished the Realschule and graduated after three years studies at the Polytechnic in Prague. This was the standard way to gain a qualification for a teacher at a Realschule. At that time (and these regulations apply to the time around 1890) qualification for a teacher at a secondary school was gained after a three-year study at a philosophical faculty of the university or at a polytechnic. More precisely, it was that a graduate from a gymnasium usually went to a university and those from a Realschule went to a polytechnic. Lerch followed Seifert's footsteps, and after the secondary school he continued studying at the Polytechnic in Prague. This decision was certainly the correct one when one wanted to become a teacher, and this was also Lerch's vision of his future, especially when he took his physical

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[4]By the way, the match factory was well-known in the whole Habsburg Empire, and flourished at that time. The plant terminated the production definitely in 2008.

[5]Seifert's son Ladislav Seifert became later professor of geometry and Lerch's colleague at the Masaryk university in Brno.

handicap into account. However, this illusion has proven not to match with reality. Moreover, for a prospective scientist, a completion of the university would have been a better choice, but for this a graduation from a classical gymnasium was necessary[6], but a vision of becoming a scientist was probably beyond the resolution competence of the people who influenced Lerch's career in this period.

During his secondary school years, Lerch reduced the lost years from the beginning of his school attendance. The so-called quarta (or the fourth grade[7]) was the starting grade of the higher level of the secondary schools at that time for which a pupil was admitted after an entrance examination. Although the law did not allow skipping classes, he was recommended to skip one grade after the tests and so he enrolled directly in the fifth grade of the Realschule in Plzeň (Pilsen). The fact that he got straight to the fifth grade was a further dramatic life event for him which he immediately and enthusiastically described very detailed in a letter to the director of his former burgher school in Sušice.

Probably under the influence of the consequences of his injury Lerch's nature has changed to the negative and Lerch stood very suspiciously in relation to his surroundings. Moreover, aware of his talent he often handled from a position of an intellectual superiority, what naturally was reflected by a sour-faced reception of the surroundings. These personal features already manifested during his high school studies, and interventions in his favor of inclined teachers was unescapable. So, for instance, although Lerch was a religious man all his life, a conflict (which he never explained in details later) between him and the catechist of the school caused that Lerch was delocalized from Pilsen to another secondary school at Rakovník in 1879 after finishing the sixth grade to prevent his definitive exclusion from the studies.

He graduated from secondary school on July 13, 1880, with honors. His school-leaving certificate contains the following examinations results: outstanding in mathematics, excellent in descriptive geometry, physics and Czech, good in French, history and geography, chemistry and natural history, satisfactory in religion, German and drawing.

Lerch's material situation was not good during his secondary school studies in Plzeň and Rakovník, but he could manage this mainly by making

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[6]Another fact, since 1872 one could not obtain a doctorate at Austrian universities without passing the final examination at a classical gymnasium and properly completing university studies. Graduates of a Realschule needed to complement externally their final exams on a classical gymnasium.

[7]Prima, secunda and tercia were the names of three grades of the burgher school, and quarta, quinta, sexta, septima and octave the names of those of gymnasium or Realschule.

his living by giving tutorials. Despite of these hard conditions for his existence, his letters show contentment with his situation, great life energy and enthusiasm. For the young Lerch, constantly struggling with scarcity and hardship, was, as he wrote in a letter to his teacher E. Seifert, one of the highest dreamboats to purchase modest mathematical books, and getting them, as he wrote, he reached his bliss. He studied them as an autodidact and reported about his progress in calculus and the higher geometry to the former teachers. From these letters and marginal notes in the books found after his death, it is possible to document that he was not always satisfied with authors' approaches. In one of his letter, dated May 18, 1878, to Seifert he commented F. Autenheimer's *Elementarbuch der Differential- und Intergralrechnung* with the words: «I do not like, that everything is approached in a geometric manner in the spirit *Man denke sich die Gleichung $y = f(x)$ geometrisch dargestellt...*» and the critique continues «Another disadvantage is that he uses the symbol $\frac{\mathrm{d}f(x,y)}{\mathrm{d}x}$ for the partial derivatives instead of $\frac{\partial f(x,y)}{\partial x}$ », etc.

At the occasion of Lerch's 60th birthday, one of his former classmates remembered an episode when a history teacher nabbed Lerch holding a voluminous German math book full of strange curves and lines on his knees under the bench. He was not able to understand how somebody could have pleasures in these crooked lines during a lesson on the history of French revolution.

Lerch used to spend holidays in Sušice with his parents and grappled with mathematics. He also cultivated contacts with his former teachers and also with teachers who came to Sušice after he leaved the burgher school. He liked woodland in Bohemian forest and he often went for a walk in the beautiful forests along the Otava river promenade path. He had several favorite places there to sit on the bench where he studied or rested. He was a good swimmer and throughout his life, he used to swim in Otava. Later when he spent summer holidays in Sušice as a professor in Fribourg, he often rented a carriage and spent several days on trips through the Bohemian forest. At that time, there it was no problem to find lodging and boarding in densely scattered German farmhouses.

> A teacher's purpose is not to create students in his own image, but to develop students who can create their own image. *Unknown author*

In autumn 1880, he inscribed to the Czech polytechnic in Prague as a full-time student of the civil engineering with the plan to graduate after three years of studies and then to pass the exam of teacher eligibility for secondary

schools. To his surprise, he learned very soon that this final step was closed
to him because he could not get the necessary health certificate required for
the teaching profession due to his physical handicap. As a result, he decided
for an academic career and therefore he passed the exams only during the
first two years and decided not to pass the school-leaving examinations. His
study program in details was as follows: In the first year 1880/81, he visited
lectures from mathematics, descriptive geometry and physics. In 1881/82, it
was mathematics, higher algebra, geometry of position, analytical mechanics,
statics and dynamics, theory of elasticity and strength, and, in 1882/83,
mathematics, geometry of position, organic geometry of forms and physics.

In addition, in winter semester of 1882/83, he inscribed also as an ex-
traordinary student (their total number in that year was 43) of the Ger-
man polytechnic in Prague, and in the summer semester 1883, he did not
visit more lectures on physics at the Czech polytechnic and focused only on
mathematics and geometry. At the German polytechnic he attended lectures
of A. Grünwald[8] on calculus according to Möbius and Grassmann.

In winter semester 1882/83 and in both semesters 1883/84, he also at-
tended lectures and tutorials by Studnička[9] on calculus, integration of diffe-

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[8]In the period 1863–1868, Anton Karl Grünwald (1838–1920) was an assistant of mathe-
matics at the Polytechnic, between 1868–1869, an assistant of physics at the university
in Prague. In 1863, he habilitated on the Polytechnic and held lectures on elementary
mathematics in the so-called preparatory year as well as a lecture on the significance of
calculus, and since 1870 he held lectures on differential and integral calculus. In 1881, he
was appointed as the second ordinary professor of mathematics, and he retired in 1909.
He worked in applications of differential calculus and in physics in spectral analysis.

[9]František Josef Studnička (1836–1903) was a Czech mathematician. He started his
career as a private teacher. Later he applied for a position of an assistant of a professor of
physics at the Prague polytechnic, but in 1864 he changed in favor of a position of a remu-
nerated associate professor of higher mathematics and analytical mechanics at the Prague
Polytechnic. When shortly after his appointment the position of professor of mathematics
became vacant, he was appointed as an acting professor for this vacant position, which
by the way was for the part with Czech teaching language. Finally, in 1869, he become a
full professor of mathematics. In 1871, he transferred to the Prague Universitas Carolo-
Ferdinandea where he became a professor of mathematics with Czech teaching language.
In 1882, the Universitas Carlo Ferdinandea split into a Czech part and a German part and
he became the first professor of mathematics at the Czech part. He was also an active con-
tributor to astronomy and meteorology. He was known as the author of several textbooks
and popular articles and he had been a member of several foreign learned societies. He was
an author of about 300 papers of not very significant quality (two thirds of them is written
in Czech). He often rediscovered known results mainly in the theory of determinants or
quaternions. Nevertheless, he was very popular, and despite all these facts he was one
the most important figures on (and behind) the Czech mathematical scene. However, as
mentioned above, Lerch's mathematical flair immediately pinpointed Studnička's actual

rential equations, infinite series and products, determinants, number theory, solution of equations and the higher geometry. Lerch was rather disappointed by the lectures, but there is no indication that this fact would adversely affect good relationship between them in this period. On the contrary, the gifted and very promising student Lerch was one of the favorites of Studnička. The financial situation of Lerch at this time was very bad, perhaps the worst ever. He worked and studied hard following his main goal – to absorb as much theoretical knowledge as possible. He lived mostly from various scholarships, which he undoubtedly received with the support and recommendation of his teachers.

At the Polytechnic Lerch visited mathematical lectures of Eduard Weyr[10]

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mathematical caliber. Therefore, when Lerch over the time turned by his own behavior against him, Studnička (and not only him) turned against himself automatically as well as the other influential mathematicians in Prague.

[10]Eduard Weyr (1852–1903) worked mainly in geometry. Eduard attended German Realschule in Prague in Mikulandská street (this legendary Prague Realschule was at its beginning associated with the Prague Polytechnic) where his father taught for more that forty years (and in 1879 was awarded a Golden Cross of Merit with Crown [13]). As a child he overcame scarlet fever, which left at him lasting aftereffects (headaches). From this reason, he did not complete the last sixth year of the secondary school. Then Weyr studied at the Prague Polytechnic and the Charles-Ferdinand University of Prague.

Thanks to his exceptional mathematical abilities and talents, he obtained a state scholarship and, in October 1872, he went to Göttingen. In Göttingen he intended to focus his interests mainly on lectures of A. Clebsch, but Clebsch soon after his arrival died. From Göttingen he brought his dissertation on the basis of which he obtained in 1873 the degree of Doctor of Philosophy. In 1873, he managed to get another scholarship, this time he went to Paris where he attended lectures on the theory of functions by Ch. Hermite and lectures on infinitesimal calculus by J.A. Serret. In the winter semester of 1885/86, he went to Berlin to learn the theories built by K. Weierstrass. However, Weierstrass held no lectures when he was in Berlin, therefore he visited lectures by L. Kronecker and I.L. Fuchs.

In 1876, he was appointed as Privatdozent (prelector) of modern geometry at Charles-Ferdinand University of Prague. In 1881, he was appointed professor at Prague Polytechnic, where Lerch later visited his lectures from mathematics. In the meantime he rejected calls to Innsbruck, Czernowitz/Tschernowitz (today Ukraine) and in 1897 even to Vienna University. In 1902, he was appointed professor at Charles-Ferdinand University of Prague but died soon after being appointed.

Eduard Weyr wrote geometrical papers and books mainly in projective geometry and differential geometry. He also worked on algebra, in particular studying linear algebra, matrices and hypercomplex systems. For instance, his name is connected with the so-called Weyr's characteristic of a matrix (cf. [19]).

In 1902, Eduard Weyr published a controversial textbook on calculus. This led to a sharp controversy with the young mathematician J.V. Pexider who criticized Weyr's textbook mainly for plagiarism.

and Gabriel Blažek[11] and geometrical ones by Ed. Weyr and R. Tilšer[12].

Between 1883 and 1884 he wrote six papers. None of them was a break-out, but they sufficiently clearly pointed out the emerging talent. His first papers were drawn from the ideas of his teachers. These were as mentioned Studnička and on the Polytechnic Ed. Weyr and Blažek. The greatest impact on Lerch had Ed. Weyr, therefore, it is not surprising that Lerch's first paper which he wrote as a student of the second year was on a classical geometric topic from projective geometry, constructions of a conic section given by five elements using Chasles' principle [6]. In another paper [7] of this period belonging to enumerative geometry he generalized a result [22] of Emil Weyr[13]. Lerch's later commented this paper by words «I wanted to

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[11] Gabriel Blažek (1842–1910) was an eminent figure in the academic life of Prague. His career was a combination of a mathematician, politician and a banker. In the years 1860–1863, he studied at the University of Prague. Then he continued his studies at the University of Vienna in 1863/64, where he passed the exam for the teaching competence in mathematics and physics for higher secondary schools in 1864. In 1865, he received a doctorate in philosophy at Vienna University. In 1864, he became an assistant at the Institute of Physics of Professor Ettingshausen. In November 1866, he was appointed as associate professor of mathematics at the Polytechnic in Prague with Czech teaching language even if his Czech command was not good at that time. When Studnička was appointed full professor at the Czech Technical University in Prague in 1871 he took his place. In 1887–1990, be was elected to the Reichsrat for the Prague Old Town, which had borough status. In 1907, he retired and became general director of the Mortgage Bank. He is author of only 13 papers from mathematics.

[12] František Tilšer (1825–1913) was professor of descriptive geometry and stereotomy in the period 1864/95 at the Prague Polytechnic. He remained loyal to the Prague polytechnic despite several calls to other universities, the most prestigious of them was a call for a chair of descriptive geometry at Vienna Polytechnical Institute after the death of Johann Hönig (1810–1886). In 1869, after splitting the Prague polytechnic into separate Czech and German institutes he devoted himself with zeal to building-up its Czech part. He was also politically active. In 1878/83, he was elected to Diet of the Kingdom of Bohemia (Sněm Království českého, or Landtag des Königreiches Böhmen in German, the highest administration body for the territory of the Czech kingdom), in 1891/97 a parliamentarian in Austrian Imperial Council (Reichsrat) and he was a prominent member of the liberal Young Czechs party (the so-called *mladočeši* in Czech).

[13] Emil Weyr (1848–1894) was a further influential figure on Prague mathematical scene. He was four years older than his brother Eduard, and was the second child from ten children of the Weyr couple. Emil attended the same Realschule in Prague where his father taught. Then he studied at the Prague Polytechnic from 1865 to 1868. Already as a student he begun to publish his first papers. His first papers were from physics. In 1870/71, he studied in Italy with Cremona and Casorati. At age 23, he was appointed as an extraordinary professor at the Polytechnic in Prague. As a graduate of a Realschule which at that time finished the school without a final exam, he was not allowed to get a PhD at an Austrian university, therefore Ernst Mach, at that time professor of physics at Prague university recommended him to obtain a doctorate outside Austria. He obtained it in Leipzig in

tease him a bit by the paper» which reflects his attitude to his teachers and growing estrangement between him and them.

Lerch later left the geometrical orientation and turned to problems of mathematical analysis. Turned away from the geometry he devoted to the study of works of Stolz, Thomae, Laurent and others, but being not fully satisfied with them, as he later said, he felt to be compelled to build his own rudiments and approaches to the studied topics. These needs led him in the academic year 1884/85 to Berlin to hear the masters of calculus. Lerch inscribed on the Philosophical faculty of the Frederick William University in Berlin (unofficially also known as the Universität unter den Linden after its location) on 10th October 1884. This stay was supported by the ministry of education with a scholarship of 800 guldens[14]. From his fellow-students Lerch

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1869. In 1875, he was appointed professor at Vienna university where he remained until his death. Together with Gustav von Escherich he founded the journal Monatshefte für Mathematik und Physik in 1890. Emil Weyr led the geometry school in Vienna throughout the 1880's up until his death. Together with his brother Eduard, they were among the most important members of the Austrian geometric school. However, the development of geometry went later in another direction as that one pursued by both brothers. In 1891, Emil Weyr became one of the first 19 founding members of the Royal Czech Academy of Sciences. Emil Weyr died at age 46 and is buried in Prague. One of his three children, son František (1879–1951) became a prominent lawyer, which among others, collaborated in the creation of the first Czechoslovak constitution. After the creation of Czechoslovakia he was a member of the Revolutionary National Assembly in 1918–1920 and, in 1919, he was appointed a full professor at Czech technical university in Brno. Thus he became Lerch's colleagues about whom he seldom expressed himself positively in his memories, and one may have the impression that his point of view was encumbered by certain family bias. For instance, he wrote [23, p. 42]: «As such Lerch was certainly an unhappy man, who carried a bitterly that his physical defect and a not very recommending appearance excluded him from the many joys and pleasures that my father and uncle were able fully to enjoy. Therefore, he was bitter and quibbling, contrary to them which were jolly and generous. In his presence, I often recalled a favorite saying of my viennese grandfather: "Hüte dich vor dem Gezeichneten!"» And he continues with a characterization of both Weyr bothers: «I learned, unfortunately, never anything more about the mutual relations of my father to my uncle. Thought they liked very much each other, or they were especially very similar what concerns their dispositions or avocations, what concerns their day-to-day lifestyle there were significant differences between them. The provincial circumstances in which indulged my uncle, would probably not be acceptable for my father, who in Vienna – especially by his marriage – got into a different surrounding.»

It is perhaps also interesting to note in connection with general political aspirations of the contemporary academics what he wrote about one of his colleagues in his memoirs [23, p. 383]: «Already in time of Austrian empire there was the highest ideal of many university professors to become a member of the parliament, or perhaps even a minister, and so to play an excellent role in the public and political life».

[14] The scholarship was certainly recommended by Studnička. The scholarships was generous, for instance it exceeded by 200 guldens the annual salary of an assistant in the

often mentioned Sofija Kovalevskaja, beside which he sat in some lectures[15]. At that time, students at the Berlin University, in the order loving Prussia, had in their credit books a special cell containing the prescribed seat number for each lecture.

In Berlin, he visited the following lectures: an introduction into theory of analytic equation and on theory of elliptic function by Weierstraß, on the theory of algebraic equations and on simple and multiple integrals by Kronecker, introduction to the theory of infinite series, on integration of differential equations, on theory of linear differential equations and on invariants by Fuchs, on solution of equation, on convergence, continuity and differentiation of analytic expression by Runge[16].

During his stay in Berlin, Lerch made friends with German mathematicians Heffter[17], Köhler[18] and Runge.

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first year of the service.

[15]This could be an interesting fact for Kowalewskaja biographers, since in standard Kowalewskaja biographies it is possibly to find that, on June 28, 1884, she was appointed to a five year extraordinary professorship position in Stockholm, what implicitly implies, that she spent the substantial part of this period in Stockholm. However, she spent summer holidays 1884 in Russia and Berlin. She tried to obtain access to lectures at the university in Berlin, but unsuccessful, despite of a Weierstraß' intervention. The rector of the university was a "decided opponent of women's rights" [5, p. 188]. But this again is not a complete truth. In early August 1884, she was back in Sweden. She spent two months with Mittag-Leffler and his wife in the country and worked mathematically. On Christmas she was back in Berlin [21, p. 131]. Hovered already in summer 1884 she applied for permission to visit some lectures at the university, what, as mentioned, the rector disapproved. When the rector changed at the end of 1884, and after a intermediation of the ministry of education she was finally allowed to visit the lectures [21, p. 130–131]. But in the summer 1885, we can find her again in Russia [21, p. 133].

[16]Runge submitted his Habilitation thesis written under Kronecker's influence in Berlin in February 1883 approximately one and half year before Lerch's arrival (Runge received his Ph.D. in mathematics at Berlin in 1880, where he studied under Karl Weierstraß). It contained his famous common generalization of Newton's, Bernoulli's and Gräffe's method for the numerical solution of algebraic equations in which the roots are expressed as infinite series of rational functions of their coefficients. The Habilitation gave him permission to held lecture at the University of Berlin. In Berlin, he continued his research on algebra and function theory being part of a circle of mathematicians which had built up around Kronecker. In March 1886, he obtained a chair at the Technische Hochschule at Hannover. He was also known on the social life scene of Berlin.

[17]Lothar Wilhelm Julius Heffter (1862–1962) studied from 1881 to 1886 mathematics and physics at Fuchs and Köhler in Heidelberg and Berlin. He graduated 1886 in Berlin under Fuchs with a thesis on integration of linear homogeneous differential equation of second order.

[18]In 1871, Carl Köhler (1855–1932) started his study as a student of chemistry at Polytechnic in Karlsruhe. Simultaneously he visited also mathematical lectures of Lüroth

Weierstraß, Kronecker and Fuchs gave him a very nice report about his talent, diligence and scientific overlook at his departures from Berlin. He went to Berlin as a student of Weierstraß, but came back as a student of Kronecker. Natural consequence of his Berlin stay was that Lerch turned from the general problems of the mathematical analysis to specific problems, particularly to those connected with the study of various aspects of special functions. Infinite series and analytic functions are the areas where he became a master. Combined with his excellent intuition he quickly grew into a world-class mathematician.

In Prague, an eleven-year period of very diligent and fruitful mathematical activity followed in Lerch's life. He wrote, as mentioned above, half of all his papers during this time. Almost every month one paper for ten years!!! In 1886, at the age of 26 years, he finished his habilitation in mathematics at the Prague Polytechnic. The name of his habilitation thesis has not been preserved. The appointment of a Privatdozent at Prague Polytechnic took place at September 14, 1886 by decree of the Ministry of Culture and Education with the clause "with a remission of a university diploma". The reason for this annex was that Lerch could not get a doctorate degree because he was not a graduate of a university, and the Polytechnic did not yet award doctorate degrees at that time. The habilitation was still in accordance with the aspired academic career of a university professor in Prague. He became a world-renowned mathematician, and so he expected to get a professor position in Prague. Unfortunately, this dream did not realize. Today we can only speculate about the exact grounds that blocked the way to his goal. A serious obstacle might have been the worsening of the relationship between Studnička and Lerch which slowly changed in hostilities. It happened sometimes after Lerch's return from Berlin. In this scenario, there might have been two factors: surrounding social atmosphere and Lerch's traits. Lerch was certainly a complex individuality who allowed only his closest neighborhood to peep into his heart. He was a bell esprit, but his jokes were sharp and direct[19].

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und Grashoff. In 1874 he moved to Heidelberg where he studied mathematics and physics with M. Cantor, Fuchs and Quincke (with one semester interruption which he spent in Berlin). His thesis in 1879 and also his Habilitation thesis submitted in 1882 in Heidelberg were on differential equations. Despite Fuchs' objections (in both cases), both were finally accepted. His lectures were very popular.

[19]Often quoted is his parable criticizing the current conditions and people from the period when he was annoyed by long and hopeless waiting for an open position: «There is no difference between my left (that is paralyzed) leg and the court council XY, both do not want to do anything, but on the other hand they want to have everywhere the priority.»

Loyalty to country ALWAYS. Loyalty to government, when it deserves it. *Mark Twain*

The Austrian Empire at that time was not only a mosaic of territories of many modern-day countries, but also a patchwork of various nationalities. Most of these nationalities were clamoring for their autonomy, especially after transformation of the original Austrian Empire into the dualist Austro-Hungarian constitutional monarchy. Such a solution of the nationhood problem was refused by most of the other ethnic groups within the Austro-Hungarian Empire. The Czech people played a crucial role in this emancipation process.

The 19th century is also characterized by the industrial revolution and the related building of factories. In the second half of the 19th century, one of the basic features of the development was the growing power of the economy located on the Czech historical territory. For instance, around 1880, the industrial production in the Czech countries were representing two thirds of industrial production of the whole Cisleithania[20].

The growing economical power formed a backbone of a nationalist movement called the National Revival (národní obrození) started in Bohemia at the end of the 18th century. Its main goal was to bring the Czech language, culture and national identity back to everyday life on all levels.

Unfortunately, although the Czechs were united in their opposition to the new dual system, they were disunited in the opinion of how to implement the defined national goals. These differences grew deeper as the 19th century progressed, and continued in the first decade of the 20th century. At the beginning, the majority of the Czech political parties supported a program calling for a restoration of the Czech state in its historical borders within the framework of the Austrian Empire. However, the political situation slowly escalated. For instance, the Czech National Party split into two parts: the conservative Old Czechs and the liberal Young Czechs. The focal point of difference of attitudes between both wings was the stand-point of the passive resistance practiced by Old Czechs. The Young Czechs gradually gained the dominance finally.

One of the crucial emancipation battle in this struggle took place on the universities soil. New professors were mostly chosen from the senior and experienced secondary school teachers[21]. In the selection process, the emphasis

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[20]Cisleithania was a common denotation for the northern and western part of Austria-Hungary, i.e., without the Hungarian lands with the Kingdom of Croatia-Slavonia, the part east (or "beyond") the Leitha river was called Transleithania.

[21]In the appointments of free professor positions at the Austrian universities, graduates

was often not given to the scientific work of applicants. The dominant factors played the length of teaching experience, perfect knowledge of German, and the loyalty to the empire. But this last point is disputable and has a wide-spectrum content depending on the standpoint of the evaluator(s). However, the decisive factor in nomination to fill the vacant professorial chairs was played by local communities, which proposed the candidates to fill the vacancies. The final step in the nomination process was subject of an approval of the Ministry of Cult and Education in Vienna. And the step of the local nomination malfunctioned in Lerch's case.

Otakar Borůvka (1899–1995), a well-known Czech mathematician, and Lerch's disciple, characterized the whole situation as follows [3, p. 354]: „The faculty of the Czech universities and polytechnic, which, moreover, were concentrated in Prague, were often enlightened men, but their wills and deeds were muted by the k. und k. (imperial and royal) dignities which they held and subject to the approval of governing places in Vienna. Therefore, it is not surprising that 36 old Matyáš Lerch who, as it seems directed his criticism and sharp wit against the mentioned dignities, albeit the author of about 120 scientific papers published in many international journals, about whom results were lectured at the Paris university, who was from 1893 associate member of the Royal Czech Society of Sciences and of the Czech Academy, is not able to find a reasonable livelihood in the Czech homeland after ten years of instructorship in Prague and therefore leaves abroad."

In more details, after his return from Berlin back to Prague Lerch worked for ten years as an assistant and lecturer in various positions under Professors Ed. Weyr and G. Blažek on Prague Polytechnic.

In the academic year 1885/86, Lerch was a substitutive assistant with annual honorarium of 600 gulden under Professor Ed. Weyr who held the so-called second chair of mathematics at the Polytechnic. In the academic year 1886/87, Lerch held lectures on analytical functions and on the geometry of rational curves as a Privatdozent what was an unpaid position at that time. In the following year, he was again assistant for Weyr and from 1 October 1888 he moved to the first chair held by Professor Gabriel Blažek with an annual salary of 700 gulden. At this position he remained until the end of the academic year 1895/96. As a Privatdozent he also substituted professor Blažek on his lectures when he was a member of the Reichstag and the Diet of the Kingdom of Bohemia in the period 1882–1892 which positions exempted him from the obligation to lecture. In 1895/96, Lerch also worked as an insurance mathematician at the Kaiser Franz Josef I Provincial insurance

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with non-Austrian diplomas were recognized only in exceptional cases.

office in Prague. He also did extensive calculations for physical, especially optical devices for manufactory of brothers Frič[22].

In the first half of the nineties, besides his duties as an assistant and substitute lecturer Lerch, held a number of lectures on special topics at Prague Polytechnic. For instance, in the winter semester of the academic year 1891/92, he gave three extraordinary lectures on potential theory, higher algebra and selected topics of the theory of numbers. In the summer semester, he lectured on analytic geometry of conic sections and on selected topics from algebraic analysis. In the academic year 1892/93, he lectured two semesters on the theory of functions. In the academic year 1893/94, he returned to the analytic geometry of conic sections. In the list of his lectures, it is possible to find the details of these lecture containing items as the theorems of Carnot, Pascal and Désargues; harmonic properties of quadrilaterals; Steiner's transformation, quadratic involution; solution of the problems of the first and second degree. In the summer semester, he held lectures on the theory of functions of a real variable – a one-hour lecture with emphasis on the theory of infinite series, uniform convergence, functions without derivatives, properties of power series, and binomial series. Furthermore, he announced a two semesters one-hour lecture on basic properties of potential theory with special emphasis on electrostatics. In the academic year 1894/95, he lectured two hours per week on selected topics from mathematical analysis with contents: general theory of functions, complex variables, theory of Laurent and Lagrange series, Hermann and Wronski interpolation series; theory of numerical equations, Sturm's theorem and Hermite's method, the fundamental theorem of the theory of quadratic forms. In addition, he lectured one hour weekly in the fall semester on the variation calculus and one hour weekly in

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[22]Brothers Josef Frič (1861–1945) and Jan Frič (1863–1897) were, not only, manufacturers of measuring instruments, and astronomical photography pioneers, but they also occupy an important place in the scientific and amateur photography of 19th century.

In 1883, they together founded a manufactory for precision mechanics in Prague, producing sugar industry and surveying instruments. Actually it was the first independent manufactory for precision mechanics and sugar industry and geodesic apparatures in Bohemia and in some production segments even in the whole of Austria-Hungary.

After Jan's sudden death from appendicitis, Josef decided to honor the memory of his brother by a realization of their old common dream – to found an observatory. In 1898, he founded a private astronomical observatory on the top of the height Manda in Ondřejov 35 km away of Prague, where he continued their astronomical research. Together with the astronomer František Nusle they constructed there a number of original equipment for geodetic astronomy. On October 28, 1928 (on the day of the 10th anniversary of the formation of Czechoslovakia), the observatory was made over to state. Today it is a part of the Astronomical Institute of the Academy of Sciences of the Czech Republic.

the spring semester on the selected topics from the theory of numbers. In his last academic year 1895/96 in Prague, he held in the winter semester a three hours lecture on insurance mathematics, and in the summer semester he lectured on modern analysis (general properties of infinite series and the products, singularities of analytic expressions and philosophy of calculus) for secondary teachers.

He also received from the Prague city council a support of 500 gulden as a travel scholarship for the year 1886 and the same amount for the next year; this time in order to write a textbook on differential and integral calculus. Lerch did neither realize the study trip nor did he write the textbook, and so he considered both scholarships as a debt which he paid off later in 1901 after he received the Grand Prix of the French Académie of Sciences in 1900.

Lerch's unconventional attitude towards his former teachers and present employers slowly changed their support into reluctance against him. It is possible that a certain role in this process also played not only his mathematical abilities or his temperament, but there are indications that in the above mentioned political atmosphere they held him as not sufficiently nationally conscious. Lerch certainly did not have political ambitions comparable to his teachers', but he was a convinced patriot. Two examples: in a lecture entitled *A contribution to the theory of point sets in plane* on May 23, 1884, at the Royal Czech Society of Sciences and motivated by G. Cantor's work, he used for the first time a documented use of the Czech neoplasm "množina" for a set. It was derived from the German "Menge", and replaced the previously used term "množství" which is a direct translation of this German word. It is possible that he was not the author of the word, maybe it was formed under an influence or approval of Studnička or Weyr or Blažek. Nevertheless, he lectured in Czech despite that time custom to lecture on the soil of the Society in German and, in addition, on a topic which he drawn from German sources. Several decades later, after the declaration of Czechoslovakia in 1918, he clipped on the lapel a long time ago prepared Czechoslovak tricolor and walked with it proudly in the public.

Briefly summarized, Lerch started with a delay in school attendance at age nine, and at age 26 he was already a Privatdozent and shortly after he was a mathematician with a world reputation. Therefore, he was legitimately expecting an adequate position at some Czech university. But this dream was not realized, not even after a decade of having an assistant position which was not possible ex lege to extend further. Just on the contrary, he was knowingly omitted at several occasions. His superiors knew very well about his mathematical qualities, but they suck out him when it was

in their interest, as for instance, when they needed him in the role of a substitute lecturer, but on vacant professorship positions they proposed only loyal candidates.

For instance, in the beginning of the 1880s, the Czech bookseller and publisher Jan Otto began planning and publishing a new general Czech encyclopedia[23]. There are indications that Ed. Weyr put in mathematics the well-oriented and knowledgeable Lerch under an obligation to specify the entries for the encyclopedia and to prompt the suitable authors. Thus Lerch became only a mediator and not a specialist-editor. However, on the official list of editors of the first edition was not Ed. Weyr; it is possible to find there the name of Privatdozent Augustin Pánek[24] as the responsible editor for mathematics, and as a fellow-editor also Professor G. Blažek, and Professor F. Studnička as one of the three chief-editors representing the universities (the total number of chief-editors was seven).

In the last third of the 19th century, the growing number of publications began to force the international community to find a way how to provide a quick way allowing researcher (and searchers) to gain orientation and rapidly and effectively access of the sources and provide them with complete bibliographical references to this effect. In 1889, the French Mathematical Society took the initiative in calling a congress to establish the basis for an international bibliography of mathematics. The congress was held from 16th to 19th July 1889 in Paris. Emil Weyr was elected as its vice-chairman and he was entrusted to organize the corresponding bibliographical work in the Austrian Empire. In the group of his collaborators for this purpose was also Lerch. Unfortunately, the first issue of the resulting *Répertoire bibliographique des*

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[23] This encyclopedia called Otto's encyclopedia (in Czech: Ottův slovník naučný) became the largest encyclopedia written in the Czech language ever. Its first volume appeared in January 1888 and the last one (28th) in 1908. It contains about 150,000 entries on 28,912 pages.

[24] Augustin Pánek (1843–1908) was a Czech mathematician. In 1868, he became an assistant of František Josef Studnička at Prague Polytechnic. In 1871, he habilitated with a thesis on definite integrals there. Then he lectured on this topic as a Privatdozent and occasionally he substituted for the lectures of Professor Emil Weyr and Professor Gabriel Blažek. Besides that he lectured on probability theory, and since 1897 he has been charged with holding lectures for students of the technical department of chemistry. In 1896, he was appointed as a extraordinary professor and, in 1904, as the full professor. The scientific work of Augustin Pánek centered mainly on the computation of certain integrals with an emphasis to pseudoelliptic integrals and to integrals of irrational expressions, which can be calculated using an appropriate substitution of elementary functions. Besides this he was deeply involved in the organization of the union of Czech mathematicians and 21 years as a chief editor of the at that time main Czech mathematical journal Časopis pro pěstování mathematiky a fysiky (today known as Mathematica Bohemica).

spiences mathématiques appeared only in 1894 after Weyr's death.

> It is during our darkest moments that we must
> focus to see the light. *Taylor Benson*

Lerch corresponded with many prominent mathematicians of his period, for instance, with Karl Friedrich August Gutzmer, Ernesto Pascal, Carl David Tolmé Runge, and Magnus Gösta Mittag-Leffler, to mention some of them. However, no one of his correspondents had as much influence on him as Ch. Hermite. It was Ed. Weyr who made the contact of Lerch and Hermite but also with the Portuguese mathematician Francisco Gomes Teixeira. Teixeira with appreciation quoted Lerch's and Weyr's results in his remarkable *Curso de análise infinitesimal*, and published their papers in the *Jornal de sciencias mathematicas e astronomica* also known as the Teixeira journal.

On July 24, 1890, Studnička asked the Ministry of Culture and Education in Vienna to create a second chair of mathematics because one educator was not able to handle the growing number od students. The situation of two chairs of mathematics was often the case at Austrian universities, for instance, at the German university in Prague. The faculty supported Studnička's proposal to establish a second chair a few months later with the addition that as long as this is not done, a three-hour payed lecture on synthetic geometry by Eduard Weyr should be established. The Ministry did not established the second chair for financial reasons, but released funds to cover the lectures. Thus from 1890 until his death in 1903 Ed. Weyr had therefore actually two positions.

For instance, Professor Blažek wrote on January 27, 1890 to Studnička: «What concerns the candidates, we may not forget that we have a long-standing Privatdozent Pánek, who was scientifically active, is an excellent teacher; it would be unfair if we ignore him, and, for that I do not think that Lerch should be as the only person additionally nominated on the vacant position, especially with respect to his hitherto smaller pedagogical competence. Therefore, if Weyr's appointment should be good for Lerch, I believe, that such an action should begin in some respect somewhat later, perhaps in one year, to give Lerch an opportunity to improve his pedagogical proficiency by taking my classes.»

There are several cases when Lerch was omitted from the list of candidates for a professorship position or he was listed on a place with a minimal outlook for a success. In 1899, the Czech technical university named after Kaiser Franz Joseph I was founded in Brno with two chairs of mathematics. On one of them there was appointed the geometer Professor K. Zahradník

(1848–1916) from the University of Zagreb after his 23 years of professorship there. Záhradník was assistant of Professor Blažek in 1872–1875. He is the author of 76 mathematical papers (mainly on geometry of curves), twelve mathematical textbooks and 27 papers for students and teachers (mainly from the history of mathematics). On the second position there was appointed as an extraordinary professor Antonin Sucharda (1854–1907) from the Prague University. Sucharda habilitated there only two years ago in 1898 for a position for a "new geometry oriented toward the descriptive geometry". He is the author of about forty papers devoted to various geometric themes, like conic sections, algebraic curves, translations surfaces, etc. In 1902, he become full professor there, but due to his bad health state he was not more active since 1904.

In February 1903, Professor Studnička died and for his classes was appointed Privatdozent Karel Petr (1868–1950), who habilitated in 1902 at the Czech technical university in Brno in the subject of higher analysis and theory of forms. Simultaneously he was nominated for a position of an extraordinary professor[25]. However, for Studnička's professorship position there was suggested Ed. Weyr. Unfortunately, he died in July before the academic year 1903/04 began. After Weyr's death on this position there was nominated Professor Jan Sobotka at that time a professor of descriptive geometry on the recently founded Czech technical university in Brno[26]. This proposal was backed up with the argument that "the university needs a geometer". As a part of a double-faced political game also a second mathematical position was simultaneously required – for Lerch. However, there was almost no chance to get also this position, because it was, globally taken, actually the third

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[25] Petr was appointed as a full professor in 1908, and retired in 1938. His 108 papers (from which 22 are from number theory) are devoted to analytic number theory, theory of algebraic forms, numerical mathematics and geometry. His textbooks on Integral calculus (first edition 1915) and on Differential calculus (1923) became a basic textbooks on this subject, and even today they withstand criticism.

[26] A the beginning of his carrier, Jan Sobotka (1862–1931) was an assistant on the Polytechnic in Prague. In the period 1886–1991, he substituted for the lectures of Professor F. Tilšer who was politically active as member of the Diet of the Kingdom of Bohemia. In 1891, he was on a stay in Zurich at Professor Wilhelm Fiedler. After the stay, he returned to Tilšer for one year, and, in 1893, he was on a stay in Breslau. After his return to Prague, he was not able to find a suitable position there so he went to Vienna where he became a teacher at some secondary school. After two years, he became an assistant of descriptive geometry at Vienna Polytechnic. Since March 1897, he was appointed as an extraordinary professor of descriptive geometry, projective geometry and graphical computation. In 1899, he became the first professor of descriptive geometry at the newly founded Czech Technical University in Brno.

required position for originally one vacancy. As expected only two position were approved. Lerch, who saw through this game tried naively to act on his own. After he applied for the position in Prague, he also contacted the corresponding official of the Ministry of Culture and Education in Vienna by sending him the offprints of his publications. However, the official refused any intervention, and participated in the theater organized by the university. It is therefore not surprising that Lerch's disappointment and rancorous was getting deeper and deeper. The question why Lerch was not nominated for the second chair at the University of Prague at this occasion remains undocumented and thus unanswered. It is also not known whether Lerch was considered at all for this position, but such a solution had been suggested by itself.

Lerch later commented the situation in a letter of June 5, 1907 to Professor Eduard Babák[27]. He wrote: «Short before his death early in 1901 my friend, immortalized brilliant mathematician Hermite, in a letter to the late Ed. Weyr laid him to heart to care for my return home; it was just when I was awarded by the main prize of the Paris Academy... that letter can be found in Weyr's estate at Mrs. Hoffrat[28] Weyr. But Weyr never thought to act in accordance with this letter and the known clique was occupied itself by spreading things of all possible kinds about me, just not the praiseful ones, in a period which was very important for me (during the time of filling the vacancy after Studnička). If this letter could be lent you, it would shed some light on a piece of my life's history.»

Hermite probably disappointed by the development in Prague recommended Lerch for a professorship position of mathematics at the newly founded University of Fribourg in Switzerland[29]. Assistant positions were by law limited to maximal ten years, and so the prolongation of Lerch position in Prague was more not possible. Thus, in this critical situation at the end of April 1896, due to Hermite's recommendation, mentioned above, Lerch obtained an appointment for a position as professor of mathematics at the University of Fribourg in Switzerland. The appointment was for ten years and the salary was fixed for the first year to 5000 francs and for the next years 6000 fr. per year. The Swiss franc had approximately the same

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[27] Eduard Babák (1873–1926) was a distinguished Czech physiologist, biologist and physician. Babák was a co-founder and the first rector of the University in Brno.

[28] court counselor

[29] The University of Fribourg was founded by an Act of the parliament of the Canton of Fribourg in 1889. The history of the university goes back to the Collège Saint-Michel founded in 1582. In 1763, an Academy of Law was founded in Fribourg around which the Faculty of Law grew up.

exchange rate as the Austrian crown, therefore this meant a salary jump from 1400 to 5000. Lerch accepted the offer because it solved his existential conditions. Later, in 1921, in one application submitted to the Czechoslovak Ministry of culture and teaching he wrote that he was forced to accept the professorship in Fribourg because of his depress living conditions.

Hermite commented Lerch's new position in a letter to him[30] as follows: «I have noted with a vivid satisfaction the big change which happened in your last days and the happy consequence of your appointment as a full professor at the University of Fribourg in Switzerland. You have reasons to believe in the Providence, which interferes in our lives in order to secure and save those with a courage to go the direct path crowning by a success all their actions, and whose aim is the science and not the success. I am prejudiced against the Bohemia, which should saved you for its honor and should recognize long ago the great importance of the papers which you wrote and which placed you on a high position between contemporary mathematicians. This leads me to a question, Sir, whether you shall publish your discoveries in the Transactions of the Bohemian academy[31] which you have enriched by a large number of beautiful mathematical treatises, and which mathematical part would be pauperized by your absence. Rather, I am inclined to believe that you remain firmly fixed to the fatherland. You undoubtedly entertain the same feelings as the famous Frenchman Laurdaire, whose expression in a letter, as I am taking the liberty to convey you, found a great echo in the reign of Louis Philippe: "I will never complain about the oppression of my homeland – I'll breath for it until the last day!".

> Not only you did not fade from our minds, we saw how your name is growing in the public and who pronounced him, certainly added: The biggest Czech mathematicians. *Lerch's classmate*

It was certainly Hermite's credit that Lerch received the Grand Prize of the Paris Academy for his work *Essais sur le calcul du nombre des classes de formes quadratiques binaires aux ceofficients entiers* in 1990 which catapulted him in into the group of the extraordinarily successful scientists. This prize made Lerch a possible candidate for the Paris Académie des Sciences. The proposal was: I. Dedekind, II. Gordan, Hilbert, Lerch, Noether (in the alphabetical order).

Hermite and Lerch met personally in Paris in August 1893, and perhaps

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[30] The collection of extremely valuable and interesting letters between Lerch and Hermite was destroyed during a bombing of Brno in the final stages of World War II.

[31] Abhandlungen der Königlich Böhmischen Gesellschaft der Wissenschaften = Rozpravy Královské české společnosti nauk

also in fall 1896, when Lerch left for Fribourg. When during the holidays in 1901 Lerch came to Paris to thank for the recognition of his scientific work, Hermite was dead and Lerch could only visit his son in law, Picard, and lay a wreath on the grave of his great friend and protecteur.

Lerch's teaching activities in Switzerland consisted for the most part of six hours of lectures and two hours of seminars per week. He lectured in German or French, in both languages he was fluent. He gave standard lectures interlaced with special topics as Malmstén series, Euler integrals, or elliptic functions, and similar themes. He also held lectures on geometry although this was the subject of the second professor of mathematics there, the Dutch mathematician Daniels. However, he was not generally satisfied with the students, with two exceptions, Marco Salvadori and Michel Plancherel. In the academic year 1900/01, Lerch was Dean of the Faculty of Sciences.

The relations with the fatherland cooled down, seven years, from 1900 till 1907, he did not publish in Czech. In the spring of 1902, Lerch was asked by the Czech Academy of Sciences and also by the University of Fribourg to represent them at the jubilee festivities on the occasion of the hundredth birthday of the Norwegian mathematician Niels Henrik Abel (1802–1829). Despite everything what happened Lerch considered for his immutable obligation to go to Christiania as a delegate of the Czech Academy.

At the end of 1901, the Czech mathematical society published the mentioned book *Differential calculus* by Eduar Weyr. Weyr was 49 years old at this time, he was a professor of mathematics at Prague Polytechnic and was one of the leading figure of the mathematical life in Prague and Bohemia at all. The book was written by invitation of the society. Despite the fact that the book was meant as a basic textbook it seems that Weyr was not the most suitable author for such book. He not only underestimated the problem of questions of a precise foundation of the theory, but he, probably due to his many side activities, simply copied passages from other foreign textbooks by Tannery, Genocchi and Serret. These facts used the young mathematician J.V. Pexider to rise a controversial affair against Weyr, who a short time before wrote a negative report on Pexider's second habilitation thesis (for further details of this controversy, consult [1]).

Weyr's prestige was shaken and the only big name which could save his prestige was Lerch. In a confidential letter to Lerch, he asked him, as a generally recognized expert, to intervene in favor for the book. Simultaneously, also the Czech mathematical society asked Lerch to write a report on the book. Lerch, in his report [11], in a masterly manner appreciates the quality of the book and its contribution to the Czech mathematical literature and

on the other hand modestly suggested that with the book is not everything all right.

Probably the most suitable person to write such a Czech textbook on calculus was Lerch, but such an attempt failed several years ago, due to his other priorities. In Lerch's estate two manuscripts were found. One is from the year 1918 and it is a monograph on Bernoulli polynomials which was intended to cover the subject more widely than at that time well-known Saalschütz's monograph on the subject (cf. [15]). It was never published, but the Czech mathematical society prepares digitalized collected works of Lerch, where the preserved parts will be digitalized. The other monograph reflects one of the main Lerch interests – the theory of elliptic function. It was planned to consist of two volumes, but only the first one was completed and it appeared posthumously [12].

At the beginning of 1905, there become vacant the chair of mathematics of Professor Sucharda at the Czech technical university in Brno, just shortly before the end of Lerch's ten years period in Fribourg. The commission entrusted to prepare a proposal of possible candidates uni loco proposed Lerch. This proposal was approved on May 30, 1906 by a large majority of professors of the university. Thus, on November 1, 1906, there started a fourteen years long period of his employment at he Czech Technical University in Brno. During this period, he wrote 31 papers. From these nine were about infinite series, eight geometrical, four about special functions, four from number theory (three of them on integral quadratic form).

Now, back home, Lerch receives various accolades. For instance, in 1907, he was elected an honorary member of the Union of Czech Mathematicians and Physics and in 1909 he become Doctor honoris causa of the Philosophy faculty of the Czech university in Prague. In the academic year 1908/09, he was Dean of the Faculty of Mechanical Engineering and, for the period 1910/11, he was elected for the rector of the Czech technical university, but in this case he demitted from this function for health reasons.

Lerch suffered from diabetes and in that time his health problems escalated caused by this disease. Stays at a health resort on vacations always temporarily improved the status, but overall the disease progressed; Frederick Banting discovered the insulin only in 1921.

Lerch's teaching activities can be characterized, as on all his previous places, by a high level of lectures and rigorous examinations, and although he did not require much volumes of knowledge, he required accurate answers.

A mathematical problem was for Lerch definitely solved when he was able to give a procedure leading to a numerical calculations yielding its solution.

About formulas not suitable for a direct computations (like determinants) he characterized as being for a mathematician as a ham behind the window for a poor man, neither of them is accessible. This attitude was probably the basis for his interest in quickly convergent series. Motivated by numerical needs he bought a Millionaire calculator performing calculation up to twenty decimal places during his employment at the technical university in Brno.

A year after the founding of Czechoslovakia, a new university, named the Masaryk University, after the first president, was founded in Brno and Lerch became the first professor of mathematics there in 1920, and thus the founder of its mathematical institute. He began with great enthusiasm at the new place, for instance he managed to equip perfectly the library, where he transferred part of his own library to the institutional. Although the Faculty of sciences began officially its academic activities only in the academic year 1921/22 he started immediately with public lectures on various mathematical themes. One of these lectures was on "On pairs of series" a notion which he used to say that it was one of his most prominent discoveries ever (cf. [8], [10]).

In mid-July '22, he went to Sušice, where in the river indulged in baths. He done so also on July 31, but, on August 1, he felt himself not well and, on August 2, the doctor diagnosed pneumonia. Unfortunately, organism destroyed by the diabetes was not able to withdraw longer the temperature and the bells in the morning on August 3, 1922 announced the dwellers of Sušice that their most famous countryman died.

As it was mentioned, the scientific work of Matyáš Lerch consists of 238 scientific papers and many other technical ones. These papers are published in 32 different journals or conference proceedings. 118 of them are written in Czech, 80 in French, 34 in German, three in Croatian, two in Polish and one in Portuguese. Differentiating by subject, about 150 of them are on mathematical analysis, about forty on number theory, other publications deal with geometry, arithmetic, numerical calculations and other topics of minor importance.

According to the Mathematics Genealogy Project, Lerch had only two, but eminent Ph.D. students[32]:

- Michel Plancherel (1885–1967) who after obtaining his Diplom in mathematics from the University of Fribourg finished under Lerch's supervision the doctoral thesis *Sur les congruences (*mod *2m) relatives au nombre des classes des formes quadratiques binaires aux coefficients*

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[32]but at least 1345 descendants

entiers et à discriminant négatif in 1907[33].

- Otakar Borůvka. Actually Lerch was only spiritual father of the Ph.D. student Borůvka. Borůvka learned Lerch as a freshman of technical university in Brno in 1918. Since 1920 he simultaneously visited Lerch mathematical lectures at the newly established Masaryk University where Lerch moved. Lerch made shortly Borůvka his assistant here. In December 1922, Borůvka passed the so-called state tests in mathematics and physics, but prior to this he started to work[34] on his doctoral thesis *On imaginary roots of the equation* $\Gamma(z) = a$. The core of the thesis was published in [2]. Borůvka received the doctorate in July 1923[35].

It seems that these records are not complete. As it was mentioned above, one of his students in Fribourg was Marco Salvadori. In 1904, he wrote his Ph.D. dissertation entitled *Esposizione della teoria delle somme di Gauss e di alcuni teoremi di Eisenstein* (cf. [16], [17]). This is clearly not only a number theoretical theme related to quadratic Gaussian sums but also closely connected to Lerch's interests (cf., e.g., [9][36]). Therefore, the assumption that the supervisor was really Lerch cannot be far from the truth.

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[33]Plancherel wrote the thesis partly during his mandatory military service in the Swiss army. With a support of a scholarship he then went to Göttingen (1907–1909) and Paris (1909–1910). In 1911 he replaced Lerch in Fribourg. From 1920 he was at ETH Zurich.

[34]In fact, the impetus to the thesis was given by the following incorrect statement stated in the Serret-Scheffers book [18, p. 220]: Für jedes von 0,-1,-2,-3,... verschiedene reelle oder imaginäre x ist der Grenzwert

$$\Gamma(x) = \lim_{m=+\infty} \frac{m!m^{x-1}}{x(x+1)\ldots(x+m-1)}$$

worin m eine ganze positive Zahl bedeutet, bestimmt und endlich. Asßerdem ist in jedem solchen endlichen Bereiche der Zahlenebene, die frei von den Stellen 0,-1,-2,-3,... ist, der Hauptwert des Logarithmus dieses Grenzwertes durch die gleichmäßig konvergente Reihe darstellbar:

$$\ln \Gamma(x) = \sum_{m=1}^{\infty} \left[(x-1)\ln\left(1 + \frac{1}{m}\right) - \ln\left(1 + \frac{x-1}{m}\right) \right].$$

Borůvka [20, p. 46] accidentally discovered this passage shortly after Lerch lecture on Gamma functions during which Lerch said "Analytical properties of the Gamma function are perfectly known, however its numerical description in the complex domain is missing".

[35]By the way, on the vacant place after Lerch's death was appointed Eduard Čech as an extraordinary professor, and Eduard Čech name is the second name of a Czech mathematician in MSC.

[36]Note, that Lerch claims in this paper that the results and proofs in some related Kronecker's papers (cf. part III of the paper) are not correct.

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