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Geology

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PEDAGOGICAL EXPERIMENT OF THE FIRST RECTOR OF THE URAL STATE MINING INSTITUTE P.P. VON WEYMARN AS AN EFFORT TO REFORM THE HIGHER EDUCATION INSTITUTION IN 1917-1920

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Based on sources recently discovered and included in the database of scientific publications, the article analyzes the pedagogical activity of the scientist-chemist, the first rector and founder of the Ural Mining Institute in Ekaterinburg Petr Petrovich von Weymarn, whose name is now almost forgotten. The article shows that this activity can be evaluated as a pedagogical experiment on reformation of the higher education institution system, which could have been adopted in Russia if Bolsheviks lost the Civil War. Pedagogical activity of von Weymarn has a theoretical basis that he developed under the influence of Wilhelm Ostwald, the Nobel Prize winner in chemistry and the idealist philosopher, as well as the example of the Petrograd (Petersburg) Mining Institute, which for von Weymarn was not only an alma mater but an example of a reformist attitudes toward the scientific and pedagogical process in higher education.

The article gives a detailed analysis of the currently available philosophical and pedagogical essays of P.P. von Weymarn, known as «Essays on the Energy of Culture», as well as the practical application of these theoretical works on the basis of the Ural Mining Institute in Ekaterinburg and in Vladivostok.

With the advent of Soviet power, von Weymarn's pedagogical experiment was forcibly interrupted, and he became «persona non-grata» in the Soviet Union, but now his name is being restored. Unfortunately, he is known either as a chemist or as the founder and first rector of the current Ural State Mining University, but not as a teacher who offered his view of reforming the higher school system. This article fills this gap, revealing not only the work of von Weymarn, but also describing the difficult period of changing the old scientific school system, which could have taken a completely different development path.

Keywords: Ural State Mining Institute, Ural State Mining University, Petersburg (Petrograd) Mining Institute, Petr Petrovich von Weymarn, education, experiment, higher education school reform

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Petr Petrovich von Weymarn
(1879-1935)

Introduction. Petr Petrovich von Weymarn (1879-1935) is a prominent Russian chemist and teacher, the graduate of the St. Petersburg Mining Institute, whose name is almost forgotten in the homeland. The reason for this oblivion is simple and understandable: von Weymarn, who did not accept the Soviet regime, emigrated to Japan in 1921, so he became a «persona non-grata» in the Soviet Union, but his works on colloid chemistry continued to be published all around the world but in German, English and Japanese languages.

At present he is known as a chemist scientist, who established the fundamental principles of colloid chemistry [9], however his works were known in rather narrow circles. In particular, in 2016, in the Internet search conducted by the Israeli physicist Evgeny Stambulchik, the result was as follows: «The articles in different languages, in descending order in according to the volume of material, contain the following results: in German (most of the intravital translations of P.P. Weymarn in this language) – 15 sentences, in Japanese (the language of the country where he lived during his last years) – 7, in English (current language of international communication) – 2,

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in Russian – 0 (zero!)» [10]. However, in 2016-2017 the scientific journal «News of the Ural State Mining University» published a number of articles written by von Weymarn and some works about him that have filled this information gap, including update of the Russian version of Wikipedia page [13].

Based on these new publications, the article describes P.P. von Weymarn from another side: as a teacher who founded in Ekaterinburg the first Mining Institute in the Urals region, relying on the original pedagogical views set forth by him in his own philosophical treatise, which he called «Essays on the Energy of Culture» [2].

P.P. von Weymarn: a short biography. Before talking about the philosophical and pedagogical views of P.P. von Weymarn, we need to give readers a short introduction into his biography and major achievements: only in this case it will be clear why his pedagogical experience can be of interest even today.

He was born in July 1879 in Peterhof in the family of old noble origin. His father was a retired Major-General P.I. Weymarn, and at his will the son graduated from the Alexander Cadet Corps. After the graduation from the Corps, the father insisted on entering the military school, but Peter in 1900 preferred to become a student of the Petersburg Mining Institute. In 1902, he already published his first scientific work in chemistry.

Petr Petrovich von Weymarn graduated from the Institute in 1908, but in 1906 he already was given the Russian Chemical Society Award of Academician N.N. Beketov and received a scholarship named after Professor K.I. Lisenko, and in 1907 he was offered the permanent cooperation with the German journal «Zeitschrift für Chemie und Industrie der Kolloide» (Notes on the Chemistry and Industry of Colloids).

In 1908, he stayed at the Petersburg Mining Institute, first as a part-time Assistant Lecturer at the Department of Physical Chemistry, then as an Adjunct Professor. In 1910-1916, while working at the Mining Institute, Weymarn taught and conducted research in the Petersburg (Petrograd) University at the position of first Privat-Docent, and then as a Professor. By 1916, he was a prominent chemist scientist, whose works were given scientific prizes and awards.

During this period, von Weymarn the Ministry of Trade and Industry made him a proposal that drastically changed his life: to head the Construction Commission of the Mining Institute that was being established in Ekaterinburg, and then to become the first rector of the new university.

After some hesitation Petr Petrovich agreed to accept this proposal and since 1916, he lived in Ekaterinburg (visiting periodically the capital, where his wife continued to live), helping to establish the Ural Mining Institute, and constructing the building for it.

The new university rented several rooms and began to operate in early October of 1917, since the construction had not been finished at that moment. P.P. von Weymarn not only selected the entire teaching staff of the institute, but also developed its original charter and syllabus.

The establishment of the Ural Mining Institute fell on the most difficult period in the history of the country. Literally two weeks after the beginning of the academic year, the Bolsheviks came to power in the country, including the Urals, and during the first academic year von Wенmarт tried to teach under the Soviet regime, while positioning himself and the institute «outside politics».

Such a position would have been unsafe for a long time, but in July 1918, the detachments of the Czechoslovak Corps occupied Ekaterinburg. For another year von Weimarn headed the Ural Mining Institute, cooperating first with the Provisional Government of the Urals, which was subordinate to Omsk, and then with the government of Kolchak.

In July 1919, Ekaterinburg was occupied by the Red Army and the Ural Mining Institute was ordered to evacuate to Vladivostok. Because of the haste and lack of organization, the evacuation was only partial: about half of the students and teachers left for Vladivostok, the rest remained in Ekaterinburg. And with the beginning of the new academic year, a paradoxical situation arose: in Ekaterinburg, the Soviet Ural Mining Institute began to work, it was headed by K.K. Matveev, who was appointed by von Weymarn as a rector; and at the same time the Ural Mining Institute began to work in Vladivostok headed by the rector P.P. von Weymarn.

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The fate of these universities was in many respects similar. Both of them existed in this status for less than a year. The Ural Mining Institute in Ekaterinburg lost its independence and joined the newly established the Ural State University, once again becoming an independent university only in the early 1930.

The Ural Mining Institute in Vladivostok, headed by von Weymarn, also lost its independence, and merged with the Vladivostok Polytechnic Institute in 1920. It is curious that at the same time the pedagogical experiment conducted by P.P. von Weymarn, not only did not cease, but even expanded, since in 1920 Petr Petrovich was elected to be the rector of the Vladivostok Polytechnic Institute, and this institute adopted the charter and general pedagogical principles developed in Ekaterinburg.

This experiment in Vladivostok, however, did not last long: at the end of the year von Weymarn left the post of rector and soon emigrated to Japan. The institute existed until 1922. After Vladivostok was occupied by the Red Army, the institute underwent many reorganizations, but even now there is a Mining faculty in the Far Eastern Federal University, the foundations of which were laid by the Urals.

P.P. von Weymarn emigrated to Japan, where he received the post of professor and researcher in Osaka, at the Imperial Industrial Research Institute. Later, he taught at the Imperial University (Tokyo) and the University of Tohoku. In those years he continued to publish articles on colloid chemistry, but not on pedagogy.

In 1931, feeling that his health was worsening, von Weymarn left teaching work and joined the private laboratory of Kobe (Japan). In 1935, he was invited to lead the Higher Technical Center in Shanghai, but soon after joining them he died. He was buried in Kobe.

Philosophical and pedagogical works of Weymarn and their practical application. From a brief biography of P.P. Weymarn given above we may have a general idea of him as a scientist, but it is not entirely clear why the professor studying colloid chemistry was invited to the post of rector of the newly opened the Ural Mining Institute and what his pedagogical views consisted of, which he applied in practice first in Ekaterinburg, and then in Vladivostok. Actually, these views and their practical application will be the subject of our research.

The object of our research is his theoretical work. The first work of this type was published as far back as 1914 in the journal of the Russian Chemical Society [5], and on its basis on December 4, 1914, P.P. von Weymarn, presented a report to the members of this society, which also appeared as a separate publication [1]. In 1915, in Petrograd they published one of his essays entitled «Studies in the energy of perception and creativity» [3]. Apparently, it was this report that prompted von Weymarn to be invited to do the pedagogical work as the rector of the new university.

P.P. von Weymarn continued to work on his essays in Ekaterinburg, and in May 1919 (two months before the evacuation) he published one of the new essays in the first (and only) issue of the students' journal of the Ural Mining Institute «Molodaya Rus» [4]. And, finally, two essays were published in the first issue of the journal «Izvestia of the Ural Mining Institute» in 1920 in Vladivostok (the first essay is the same one that was published in the journal «Molodaya Rus», and the second was called «The Development of Natural Science as an indicator of the culture of the nations»).

The study of these sources is very difficult, since not only these pre-revolutionary publications are not readily available in our time, but also the publications of the 1919-1920, which are the most important, since they were published on the results of his practical experience. After emigrating to Japan, P.P. von Weymarn no longer published articles on this subject.

The only copy of the journal «Molodaya Rus» is available at the library of the Ural State Mining University (Ekaterinburg), where researchers rarely work on this issue.

The first issue of the journal «Izvestiya of the Ural Mining Institute» (1920) was preserved in two copies, one of which is in the Sverdlovsk Regional Universal Scientific Library n.a. V.G. Belinsky, the second one is in the library of the Society for the Study of the Amur Re-

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gion (Vladivostok). This journal is more known and accessible than «Molodaya Rus». However, with the help of these available journals, the study of P.P. Weymarn's works does not seem to be possible. The fact is that the journal «Izvestiya of the Ural Mining Institute» in 1920 was published in two versions: the first – the full version of the journal was designed «for scientists», the second one, shortened, was published «for students». Both currently available copies are «student» ones, i.e. Weymarn's essays in them are only mentioned in the content. Only very recently a researcher from Vladivostok, N.V. Khisamutdinova, found in the archives of the library of the Society for the Study of the Amur Region a separate copy of the article by P.P. von Weymarn from the full issue of the journal «Izvestiya of the Ural Mining Institute» and published it in a separate brochure [11]. In 2016 the journal «Izvestiya of the Ural Mining University», which is the legal successor of the journal «Izvestiya of the Ural Mining Institute «re-published these essays, which are now also available on the journal's website [12]. Thus, these publications have become available for research relatively recently.

The relevance of the practical application of pedagogical views of von Weymarn can be judged from the first issue of «Izvestiya of the Ural Mining Institute», where, in addition to the essays already mentioned, a whole section is devoted to the academic life of the Ural Mining Institute [12].

«Essays on the Energy of Culture» by P.P. Weymar. The first of the published essays (five of them was planned for publication, but only two are now available) was devoted to the concept of energy and the issue of rational education, the second concerns the development of natural science as an indicator of the culture of nations. It is known that the third essay was to prove that the progress of the natural sciences is a requirement for the self-preservation of nations and mankind, and in the fifth, the basic laws of the dead and living nature should be described.

In all of his essays, von Weymarn is actively quoting the writings of Wilhelm Ostwald, from which it can be concluded that the philosophical and pedagogical views of von Weymarn were primarily formed under his influence. However, in the last two articles (published in 1920 in the journal «Izvestiya of the Ural Mining Institute») Weymarn, without abandoning the basic postulates of Ostwald, creatively develops his theory (including the context of education in Russia), and also shows examples of its application in practice at the Ural Mining Institute.

It is important to say a few words about Wilhelm Ostwald (1853-1932), whose works are actively quoted by von Weymarn. Wilhelm Friedrich Ostwald is a Nobel Prize laureate winner in chemistry (1909). He was born in Riga having the citizenship of the Russian Empire and nationality of Ostsee German. Ostwald became not only an outstanding chemist and physicist, but also an idealist philosopher, the author of the concept of «energy science», in which energy is regarded as matter and the spirit is considered to be a form of manifestation for this energy. The works of Wilhelm Ostwald in Russia were printed exclusively before the revolution and were re-published only in 2006 [7]. The main book of V. Ostwald «Great People» [8], which is quoted by von Weymarn, has not been republished in modern Russia. The influence of his writings on the views of P.P. von Weymarn was probably also due to his close acquaintance with the son of Wilhelm Ostwald, Karl Wilhelm Wolfgang Ostwald (1883-1943), who headed the journal «Zeitschrift für Chemie und Industrie der Kolloide» (Notes on Chemistry and the Industries of Colloids), and with whom Weymarn actively collaborated until the end of his life.

P.P. von Weymarn, using the basic postulates of the philosophy of Wilhelm Ostwald, makes his own conclusions on this basis, which is easy to follow from the texts of essays that we analyze.

From the preface of P.P. von Weymarn to «Essays on the energy of culture» [2, p.101-102]. Cultural science, according to Ostwald, is «energy sociology», which, like physiology and psychology, is part of natural science and belongs to the group of biological sciences. «Voice of the people», for example, is the voice expressing the degree of its culture.

Two laws postulating the Ostwald energy science. The first one sounds like all the mental creative energy, aimed at the creation of Perpetuum Mobile of the first and second kind, did not give a positive result. Second – the observed processes lead to energy dissipation. And in this case, Weymarn considers «illegal» to derive from these postulates the imminent death of the universe, believ-

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ing that the third postulate should be the following: «it is inconceivable in a certain volume of space to concentrate this or that energy above a certain limit. In case of presence of any excessive amount of energy, it will turn to other types of energy». Thus, the universe will be saved by spontaneous expansive processes, which is also applicable to humanity, in which the progress of culture will become the «key» that can «unlock chests with contractive energy» by raising culture. The life of living nature is a change of creative and destructive processes, with a certain direction towards creative ones.

The first essay «On the rational organization of education for raising the creative energy of the country» [2, p.103-105]. The basis of Ostwald's idea that the whole set of mental processes and phenomena is controlled by a separate kind of energy – psychic energy, Weymarn considers reasonable to apply this principle to the «rational organization education».

Based on physical laws, energy is work. And everything that can be obtained from work, again turns into energy. In the measurement of this energy, there are two most important factors: capacity and intensity. The capacity factor obeys the conservation law: for all possible changes, the sum of the capacitance values remains constant.

The laws of energy can be interpreted as follows: first – one cannot create any kind of energy from nothing. The second is that there will be no energy process unless there is a difference in the intensities of the energy reservoirs; if there is a difference in intensity, then the process is directed towards the lower intensity (water does not flow from the lowest to the highest level by itself without any external force applied).

The second law can be expressed in the form of a process productivity factor. Since no kind of resting energy can spontaneously enter a working state, then this coefficient must be a determined one (constant). The coefficient of productivity consists of the sum of accumulative and creative types of energy.

From this von Weymarn makes a rather paradoxical and controversial conclusion, which is one of the most famous in his writings: the maximum of creative energy is (in most cases) is in the age between 20 and 35 years, with the peak usually lying not far from the 25-year-old age, being close to 28 years old. After 35 years, the curve of creative energy begins to drop, and after 50 years the decline becomes very significant. From this it follows that education in general should not exceed 10 years, and it would be rational to attend a secondary school for a maximum of 6 years, and a higher one – a maximum of 4, i.e. education must end by the age of 19-20 years.

The second conclusion is connected with the dependence between accumulative and creative types of energy and is explained with a curious example. A person of average knowledge and small creative abilities in a highly cultured country cannot increase significantly and quickly the level of its culture to a higher degree of intensity. However, the same person in a low-cultured country can significantly and quickly raise the culture of the nation. Thus, a person can be useful only to those representatives of the nation whose intensity of psychic energy is lower than his own.

As a side-effect, von Weymarn formulates the law of limitation when scientists begin to represent «walking encyclopedias» that are either very few or completely incapable of creativity, citing the words of the English scientist William Ramsay who claimed that too much knowledge is a hindrance for creativity.

Here, perhaps, it is appropriate to take for example a current situation in our society, when access to virtually unlimited pool of knowledge gained with the help of the Internet has not made people either smarter or more creative.

Weymarn talks about the wise limit of knowledge, which should not overload the brain. Formulas or strict dogmatic formulations can be taught to be found in relevant journals, where it is more important to understand the general idea of the proof and to teach to quickly orient yourself in research procedure (and again – an analogue with a modern search on the Internet!).

From all the conclusions of von Weymarn it follows that the task of an institution is that the useful act of learning must correspond to biological laws and not put pressure on the genius people, giving them the opportunity to develop.

DOI: 10.25515/PMI.2017.6.616

Analyzing modern high school with the help of energy laws, he comes to the opinion that this school, especially the technical one, violates all laws of energy of perception and creativity. A man of average abilities is forced to spend in general about seven years trying with great difficulty to memorize difficult proofs to pass the exams, which he then forgets in a week, thus not increasing, but on the contrary – lowering the transformational functions of his brain and by 30 he already has a worn-out transformer apparatus and, of course, is no longer able to be a creative technician, compelled to play the role of an artisan or apprentice. The same can be said about scientists who also for the most part remain apprentices or become artisans only in the field of science.

The second essay «Development of natural science as an indicator of the culture of nations» [2, p.105-109]. Science is the last and highest level of continuous cultural development. Summarizing this thesis of W. Ostwald, von Weymarn understands the general term «science» as a natural science, which means science in the broad sense of this word and a term including all other sciences originating from natural scientific background.

P.P. von Weymarn singles out two factors that influence the development of natural science in different countries. The first is the level of the peoples' culture, the second is the economic position of the scientists of a particular country. He supports his idea with an example of regress of science in Italy and in the provinces of France. Then he begins to analyze the classes, from which scientists come out, coming to the conclusion, that prominent individuals appear mainly from the class that is the longest carrier of education. He comes to the conclusion that geniuses among the illiterate people are disappearing and quite rare and it is necessary to convince everyone who cares about the culture of their people that a systematic introduction of rational universal education is necessary for its development.

Then he gives a very interesting study of the astronomer of Harvard University, E.S. Pickering, who in 1909 tried to assess the culture of various nations, taking for the factor of evaluation the ratio of the number of the entire population to the number of scientists of this nation selected by members of at least two foreign academies (recognized across the world). According to Pickering, Asia, Africa, Australia, as well as European countries such as Spain and Portugal were not in the list of the cultural countries. In the first place he had Norway, followed by Saxony, Denmark, England, France, and Italy. In the penultimate place was the US, and at the last was Russia, where there was one globally recognized scientist per 48.9 million people. The highly praised by von Weymarn Ostwald suggested that instead of calculating the number of scientists factor we should consider the ratio of scientific societies, but this recounting gave approximately the same result.

Weymarn proposed his own version of assessment of the culture of nations, using two factors: the first is the current cultural state of the country, the second is the potential for cultural development. The first is the ratio of scientists-creators to the total population of the country, the second is the ratio of the same number of scientists to the number of people having the highest education degrees. The scientist-creator according to Weymarn is not one who, in Pickering's opinion, is chosen by two or more foreign academies, but a prize winner or an honorary member of some narrow professional scientific society.

Based on these two criteria, Weymarn created his own table, and by the coefficient of potential culture, Russia's status was somewhat more comforting, although it still took its place in the bottom of the ranking list. Weymarn explained this result by two reasons: the material insecurity of the people of science and the cumbersome and incorrect principle of wage formation.

The reform of the academic school, proposed by P.P. von Weymarn, on the example of the Ural Mining Institute. Having come to the theoretical conclusion that the level of culture in Russia directly depends on the level of scientists' salaries, von Weymarn proposed his own version of an equitable distribution of funds that was developed and put into practice by him at the Ural Mining Institute – by voting of members of the institute's council. We are talking here about the transformation of past existing system of titles and salary levels, which now seems not quite understandable, but the basic principles underlying this reform can be relevant even now.

DOI: 10.25515/PMI.2017.6.616

So, in the Ural Mining Institute there were established three categories of teachers: professors, associate professors and privat-docents. Privat-docents were people who received higher education and decided to devote themselves to work in higher education field, but not yet achieved success in scientific work. Associate professors are persons who have already showed some achievements in the scientific and pedagogical field, but who do not yet have such scientific works that could serve as dissertations for the title of professor. Professors are persons who defended their thesis. The most experienced associate professors could become acting professors, but for a period of not more than three years under the condition that during this period they will defend the thesis, otherwise they must leave this post.

A distinctive feature of teachers of higher education from teachers of schools of lower levels was scientific work, and particularly outstanding scientific activity was valued and paid above standards. This was the difference between the new system and the old one, where the key factor was the length of service. So, for example, the council of the Ural Mining Institute decided that the honored professor should be considered not the one who served for more than 25 years in one place, but the one who conducted outstanding scientific activity during his service, whose works were given honorable awards of some academic societies and institutions, and who has some scientific fame. These professors were given the salary at least 50 % more than the usual professorial salary. This was explained by the fact that the state should particularly appreciate its outstanding scientists and, accordingly, pay for their work.

But there existed some objections to this method of encouragement, and they were raised by persons whose merits were connected directly to the length of service. However, the argument was that such a system in the Ural Mining Institute would still not be able to be preserved, because for higher schools of all types the payment system should be uniform on a nationwide scale. They explained that this was done within the framework of rational education that is necessary to raise the country's culture with an example that a true scientist could not have come up with such naive primitiveness to seek a solution to the problem with a complex variety of phenomena: one should conduct long experiments, in this case, higher schools should try different systems and then choose the best one as the standard.

An example of such diversity is the Petrograd Mining Institute, which had the right to replace the staff members of its departments of natural sciences with their graduates after defending a dissertation and in order to be placed on a professor’s position one should have master's or adjunct degree. The Ural Mining Institute received from the State Duma and the State Council a bill that gave him the same rights as the Petrograd Institute. Thus, these legislative institutions recognized the experience of the Petrograd Institute and allowed the Ural Institute to be equal to it, and not to the standard of the remaining technical higher schools in Russia. The reason for this was that the Petrograd Mining Institute brought up outstanding academicians, especially in the departments of chemistry, geology, mineralogy and mathematics.

Conclusion. P.P. von Weymarn appears to be the scientist and educator of a new formation shaped within the framework of criticism of the old higher school. And the Ural Mining Institute was one of those institutions of the new school, which, along with the Petrograd Mining Institute, proposed reform ways to solve the problems that had accumulated in the system of higher education in Russia.

The radical changes that the Soviet government offered in all spheres of life, including in the higher education, were not accepted by P.P. von Weymarn. Having worked for one academic year under the Soviet regime, Weymarn was able to hold on to the position of «high school is out of politics», but during this year, apparently, he realized that he would not be allowed to continue to stay at this position, so he did not hesitate to evacuate first to Vladivostok, where he again faced the consequences of the Soviet regime, and went abroad. Indirectly, his position is confirmed by the fact that the remaining institution in Ekaterinburg, which under the leadership of K.K. Matveev tried to remain independent, was soon reorganized, and Matveev was transferred to a position of a teaching assistant and only later after a long struggle and tal-

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ented work he succeeded in becoming the head of the department. An example of the fact that in 1920 the Vladivostok Polytechnic Institute, where the university was evacuated to from Ekaterinburg, adopted its charter and the principles of conducting scientific and teaching work were applied, indicates that the principles of reforming the old higher school proposed by von Weymarn were viable and could be implemented in practice in different educational institutions with the approval of academic councils. This was one of the options for the future of higher education, which could have been be adopted as an efficient tool after the defeat of the Bolsheviks in the Civil War.

The Soviet government did not accept all those principles that guided the work of P.P. von Weymarn during the reform of the old higher school, and he emigrated abroad, concentrated on research work and teaching as a chemist, no longer publishing philosophical and pedagogical works. His works that he wrote but didn't publish are either already lost forever or lost in archives abroad.

The pedagogical experiment started by von Weymarn was forced to be stopped due to the political changes and establishment of Soviet regime, and he became a «persona non-grata» in the Soviet Union, but now in Ekaterinburg he is remembered as the first rector of the Ural State Mining University. And recently discovered publications tell us not only about his scientific, but also his pedagogical activity, which is also worthy to be closely studied.

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