DMITRY MENDELEYEV

Childhood and education. First scientific achievements

Dmitry Ivanovich Mendeleyev was born in Tobolsk. He was the last, seventeenth child in the family of Ivan Pavlovich Mendeleyev, the director of a gymnasia and public schools of Tobolskaya province. Dmitry Mendeleyev's grandfather was a priest in Tverskaya province. His father had also graduated from Tverskaya theological seminary. Then, however, he entered the section of philology of the Main Pedagogical Institute in Petersburg. The post of the father at the moment of birth of the last child was one of the most honourable in the town. And the remarkable intellect, high level of education and creative approach to teaching marked Ivan Pavlovich out of the teachers' sphere.

Mother of Dmitry Ivanovich, Maria Dmitrievna Kornilyeva, came from an eminent merchants' family. There was a legend in the family that one of the ancestors had got married for love an Orient beauty. He loved her so much that, when she had passed away, he died of grief. The niece of D. I. Mendeleyev Nadezhda Yakovlevna Kapustina-Gubkina wrote, "...A stream of the Mongolian race's blood got into the clear Great Russian blood of Kornilyevs, and several descendants of it even have something oriental in their type..."

The clan of Kornilyevs was proud of the fact that they were the first who started to establish factories in Siberia: papery and crystal. In 1787 they established the first typography in Tobolsk and since 1789 they started editing the first newspaper in Siberia «Irtysh», they printed books.

The big family of Mendeleyevs started living well. The nanny from serf peasants Paraskovya Pheraphontovna, who stayed in the family of Mendeleyevs till her very death, helped to look after the elder children. The father of Maria Dmitrievna, Dmitry Vasilyevich Kornilyev, also lived with them. Already in youth he was ill with a brain fever and he couldn't work any more. Later D. I. Mendeleyev's sister Ekaterina Kapustina remembered about the beloved grandfather like that: he was a grey-haired, thin and short old man. He was quiet, kind, imperturbable and lead calm and idle life. Every

day he went to the mass, then he used to read in his room, he wrote prose and rhymes – in general, "what he liked." Dmitry Vasilyevich always used to pray in the evening. And after prayer before going to bed, when everything around became silent, he walked around the house with a candle: he watched whether the windows and the doors were closed. Then he went to the porch and watched whether the attic, inner porch and larders were locked.

Ekaterina Ivanovna wrote, "Remembrance about grandfather is always connected for me with a kind, comforting feeling, as we remembered him, he was never able to offend anyone and endured everything resignedly.

Next to the remembrance about the holy old man I want to tell about his grandson, i. e. about my brother Dmitry Ivanovich. This is my dear brother, the pride and comfort of our family. My heart is full of gratitude to him for his concern for me and my children at anytime..."

Mitenka, loved by everyone, was born on January, 27th (February, 8th) of 1834. This year was a hard one for the family. Ivan Pavlovich had to retire since he had become almost blind. The family had to live on his small pension. The Mendeleyevs moved from Tobolsk to the village of Aremzyanka, where the glass-work, which was inherited by the brother of Maria Dmitrievna Vasiliy Kornilyev, was situated. Maria Dmitrievna got a letter of attorney to manage it.

Dmitry spent his childhood and early youth in the village, among peasants and mill-hands. The problems of manufacturing and agriculture were constantly discussed at the Mendeleyevs. Mother, Maria Dmitrievna, worked tirelessly. She wrote, "My day starts at six o'clock in the morning with the preparation of dough and pastry for rolls and pies, then with the preparation of meal and at the same time with personal orders for the business. Moreover, I walk to the kitchen table, then to the bureau and during the days of payments – right from the cooking to the accounts." Ivan Pavlovich worked as long as possible. In such an atmosphere Mitya got a respect to labour, interest to the industrial work and agriculture, which remained in him for the rest of his life.

Mitya learned to read, write and count very early. He grew being a bright child. His sister Ekaterina Kapustina liked to tell about the mother wit of her younger brother like that. When she was already married and lived in Omsk, mother with a 6-year-old Mitya visited them sometimes. While entertaining the child Ekaterina Ivanovna played with him a card game, which had been popular then, "tintere" and "sticks", where the counting played the main role. Little Mitya always defeated his grown-up sister.

When he was 7 years old, he was already prepared to enter gymnasium together with his elder brother Pavel. Mitya studied at gymnasium without any especial progress, treating bona fide only those subjects, which he liked and which didn't require intensive work. He liked mathematics, physics and history. He was absolutely indifferent towards the Russian philology and religion. He couldn't stand foreign languages – German and Latin, and only the threat of remaining in the same form for the second year made him study.

The last years of Mitya Mendeleyev's studies at gymnasium were saddened by misfortunes. In October of 1847 his father Ivan Pavlovich died, three months later one of his sisters Polina – died. In June of 1848 the glass-work in Aremzyanka, which had been for a while the main source of the family's subsistence, burned down entirely. Maria Dmitrievna had no choice but to liquidate the farm and to leave the native places forever.

The Mendeleyevs passed winter of the 1849–1850's in Moscow with the brother of Maria Dmitrievna, and in spring of 1850 they went to Petersburg cherishing hopes that Dmitry would be able to enter one of the academies of the capital. They chose the Main Pedagogical Institute (MPI), where Dmitry's father had studied. The institute was located in the same building with the University, in the building of the Twelve Collegia. It didn't enjoy wide popularity because of its specialization, but the education here was of the highest level: the professors of the University and academicians were teaching here.

However, the year 1850 wasn't for entrance. Mother had to do everything in her power so that her son would have been admitted to the entrance examinations; institute friends of Ivan Pavlovich Mendeleyev, who lived in Petersburg, helped her. At the end of summer of 1850 Mitya Mendeleyev was admitted to the physico-mathematical faculty of the Main Pedagogical Institute as a student "at the state expense". In autumn of the same year, as if having fulfilled her main mission, Maria Dmitrievna Mendeleyeva died. Before death she willed: "...to insist in labour and not in words and to look for God's and scientific truth patiently..."

Nadezhda Yakovlevna Kapustina-Gubkina wrote in her notes about the Mendeleyevs that Maria Dmitrievna loved all her children, but most of all the youngest. Before death she blessed her son with the icon of the God-mother, where was the following inscription:

"I'm blessing you, Mitinka. All expectancies of my old age were based on you. I forgive you all your mistakes and beg you to address to God. Be kind,

honour God, Tsar, Motherland and don't forget that you should be responsible for everything at the Trial. Forgive and remember your mother, who had loved you more than anyone."

Many years later, in 1887, being already a well-known scientist, D.I. Mendeleyev dedicated his work "Research of aqueous solutions according to the specific gravity" to his mother: "This research is dedicated to the memory of my mother by her last-born. She was able to nurture him only by her labour, managing the factorial affairs; she educated with her example, corrected with love and moved from Siberia, spending the last might and means, in order to devote to science."

Student Mendeleyev didn't have any unloved subjects. Most of all he was keen on abstract mathematics; he paid a great attention to chemistry and physics. But also he studied zoology, botany, he was interested in the sciences, which were studied at the historico-philosophical faculty, he studied at the laboratory of electrotype. Mendeleyev proved to be a many-sided, extraordinarily capable and originally thinking researcher. Intensive work let him enter quickly the number of the best students of institute. When he was a student in his elder year Dmitry Mendeleyev chose for himself two main directions of research: chemistry and mineralogy.

After having graduated the MPI, Mendeleyev presented his dissertation, which was named "Isomorphism in connection with other relations of crystal form to the composition." Isomorphism is an identity of crystal form under the difference in the solution. This phenomenon is extraordinarily widespread in the minerals. The work, made under the direction of professor A. A. Voskresensky, was of great importance for the future development of scientific interests of the young scientist. At the end of his life he wrote, "In the Main Pedagogical Institute it was required to write a dissertation on one's own subject – I have chosen isomorphism because I was interested in the things, which I had discovered by myself...and the subject seemed to me to be important in natural historical sense...The compiling of this dissertation involved me most of all to studying of chemical relations. Thus, it determined many things..."

Studying of isomorphism made Mendeleyev clarify the similarity and distinction between the chemical compounds, and 15 years later – to discovery of the periodical law of chemical elements.

In spring of 1855 D. I. Mendeleyev successfully passed the finals in all subjects. Academician U. F. Frizsche, who was present at the final in chemistry, highly appreciated the Mendeleyev's knowledge and in his letter

to the director of the MPI supported the idea of giving this graduate an opportunity to continue his research. In Frizsche's opinion, Mendeleyev was to get a place for the future work in one of the university's cities.

Mendeleyev, however, wasn't able to take advantage of the opportunity to stay at the institute because of the state of health. Already in 1853, having been ill with consumption, he got to the institute sick quarters. Then the physicians didn't hope already that he would get well again, but Dmitry Mendeleyev recovered and wrote to the doctor in charge of the case a report with a request to take the next exam.

After having finished his studies, Mendeleyev had been appointed as a teacher of gymnasium in the Crimea. Southern air was health-giving for him. He was prescribed to go to Simferopol. But Mendeleyev couldn't start working: there was the Crimean war of the 1853–1856's, Simferopol was situated close to the battle-ground, and the gymnasium was closed. Dmitry Mendeleyev learned that there was a vacant post of teacher in Odessa.

During winter and spring of 1856 Mendeleyev worked as a chief teacher at the gymnasium attached to the lycee de Richelieu. His teaching was of a lively, original and creative nature. Except teaching according to the curriculum, he planned to write a guide for gymnasia, where, according to him, he planned "to describe gases, liquids, geological materials, minerals, remains of the organic creatures, plants starting with the lower ones and animals starting with the human being as a type, who forms a special class, and to finish with... geography."

Dmitry Mendeleyev not only took an active part in the work as a teacher of mathematics and physics and later of other natural sciences, but he also continued his research. The work generally named "Specific Volumes" was the logical continuation of studying isomorphism. This work was a many-sided research, which is possible to be considered as a peculiar scientific trilogy, devoted to the pressing questions of chemistry of the middle of the 19th century. The scientist addressed to the deeper study of the substance structure, to the problem of the atom and molecule volume. The work appeared to be not only deserving the presentation as a dissertation for the Master's degree, but right away it became the foundation of the second dissertation "for the right to deliver lectures." After having come back to Petersburg from Odessa, the young scientist got an opportunity to stay in the capital and to get the post of professor's substitute at the University.

In 1859 D. Mendeleyev got a permission for a foreign trip "to improve in the sciences." He went abroad with a properly worked out original programm of the research. The theoretical idea of the close connection between the physical and chemical characteristics of the substance became its foundation. During this period Mendeleyev especially emphasized the research of the cohesion of the particles. He supposed to study them by measuring the surface tension of the liquids (the phenomenon of capillarity) at the different temperatures.

Dmitry Ivanovich wrote, "Being sent oversea in 1859, I studied only the capillarity, supposing to find there the clue to the solution of many physico-mathematical problems"; "...I intended to determine the interdependence between the particle volume and the cohesion"; "The measure of the solid cohesion, undoubtly, is an attribute more intrinsic than i. e. the boiling-point, and until now we have very few data about it."

Dmitry Mendeleyev left Petersburg without having any clear idea of a science center of Europe where he was going to work. In a month spent on travelling around different cities, he chose Heidelberg, in the well-known university of which worked R. Bunsen, G. Kirchhoff, E. Erlenmeyer and other prominent scientists.

Having settled down in Heidelberg, Mendeleyev right away decided to establish his own laboratory, since it was impossible to carry out such "delicate experiments as capillary ones" in the laboratory, offered him by R. Bunsen. While starting to work the scientist gave a great consideration to the acquirement of good measuring instruments and their thorough study. While working in Heidelberg, studying the interdependence of the particle volume and the cohesion and studying the capillarity, D. Mendeleyev worked out the system of metrology and created the unique measuring equipment. For instance, he developed a fundamentally new instrument for the determination of the liquid density, which was later named after him, – densimeter of D. I. Mendeleyev.

Concerning the series of works of the 1850–1860's, connected with the research of liquids, Mendeleyev told about it at the end of his life: "Being partly disappointed, I had absolutely given up this difficult subject, where, however, I was thinking independently. It is evident because I discovered the «absolute boiling-point»". He succeeded to determine that liquid had turned to steam under a certain temperature, which was called by him the absolute boiling-point.

This discovery is the first important scientific achievement of Mendeleyev. Later, after the works of T. Andrews, another term firmed up in the science – "critical temperature." However, Mendeleyev's priority in the ascertainment of this significant phenomenon is nowadays undoubted and generally acknowledged.

Mendeleyev's works on the subject of capillarity, realized by him in Heidelberg, are the logical continuation of his previous research. After having analyzed the whole of the scientist's works and plans at the end of the 1850's, it is possible to say that he longed for constructing the general system of physico-mathematical knowledge. Obviously, as a result of his research of the specific volumes the scientist made sure that knowledge about the atom size and the positional relationship of the particles wasn't enough for the complete explanation of chemical characteristics of substances. He came to a conclusion that they should be supplemented with the characteristics, which were defining the force of interaction of the particles. Mendeleyev tried to work out the main regulations of a special theoretical discipline – molecular mechanics, which rests upon the three values: weight, volume and the force of interaction of the particles (molecules).

The attempt to construct the molecular mechanics is very interesting. It is an example of the orientation of the scientist's works to the significant theoretical generalizations. Though today this idea is only of a historical importance, nevertheless, it describes perfectly the independent approach of the scientist to the solution of the problems of the substance structure. In the middle of the 19th century it hadn't been generally acknowledged yet and it had been supported only by individual scientists in different countries. The molecular theory started to be generally acknowledged only after the International chemical congress in Carlsruhe in 1860.

Participation in the International chemical congress, which took place on September, 3rd–5th of 1860, became for Mendeleyev one of the most bright events of that year, which influenced greatly upon his choice of scientific interests during the following years. Mendeleyev came to the congress as a member of the delegation of Russian chemists, where were N.N. Zinin, A.P. Borodin, L.P. Shishkov, etc. During the congress's work Dmitry Mendeleyev got acquainted with many prominent scientists of Europe. Those were J.-B. Dumas, Ch. Whrza and S. Cannizzaro, G. Rosko, etc. He continued communicating with them later.

It is difficult to overestimate the meaning of the International chemical congress in the history of chemistry. There was accepted the common

system of atomic weights and were defined the conceptions of the molecule and atom.

As stated above, the scientific conceptions, which had been generally acknowledged at the congress of 1860, appeared in Mendeleyev's research even before; the fundamentals of the molecular theory, as well as the principles of defining the molecular weight and density, were delivered by him at his lectures.

At the beginning of the 1860's another important event took place in the life of D. I. Mendeleyev. On April, 29th of 1862 there was a wedding of Dmitry Mendeleyev and Theozva Nikitichna Leshchova, the stepdaughter of Pyotr Petrovich Ershov, the authour of the fairy-tale "Konyok-Gorbunok" ("The gibbous horse"). The wife was six years older than her husband. Their first-born son was Volodya, then daughter Olga was born. But this marriage wasn't a happy one. Active work of a scientist, his uneasy way of life appeared to be far from the supposed ideal of wife. Interests and characters of this married couple were too different. At the beginning of the 1870's their relationships started being complicated. Theozva Nikitichna gave her husband absolute freedom under the condition that the official marriage wouldn't have been annulled.

In spite of the difficult relationships with his wife, D. I. Mendeleyev always behaved towards the family very carefully and responsibly. Especially he loved children, he often said, "Whatever I do and, however, I'm busy, I'm always happy when any of them comes to me." The only thing, which could interrupt his work, were the children. If he suddenly heard the children's screaming or crying, right away he rushed to find out what had happened. He used to come running and frightened, screamed loudly and threateningly, but in no circumstances at the child, but at the nunny. The nunny experienced it almost always and the children – never. Dmitry Ivanovich said, "I experienced many things in my life, but I don't know the better happiness than to see my children next to me."

His niece Nadezhda Yakovlevna Kapustina-Gubkina remembered that he loved and worried not only about his own children. In Boblovo – the estate purchased by D.I. Mendeleyev in 1865 on an equal footing with his friend N.P. Ilyin – in summer there were having rest several families with their children. The kids were always around the master of the house, they used to walk with him on his household business. It was interesting for them to listen to the stories of Dmitry Ivanovich, to walk with him about the forest, to share with him their joys and sorrows.

N.Y. Kapustina-Gubkina remembered an episode, which had vividly illustrated Dmitry Ivanovich's delicacy towards the child's soul, his kindness, "In the morning my elder brother and sister were teaching us in Russian and in French. I perplexed in my translation and my sister was keeping me for a long time under the lesson. Dmitry Ivanovich was passing by the sitting-room, where we were studying, and told my sister casually:

– Why are you exhausting her over the book, Anyuta? Let her walk, she will have time.

Right away I ran away, but after forty years I remember how kind he was towards the child's soul."

D.I. Mendeleyev is a scientist, a teacher, a public figure

The 1860's became for Dmitry Ivanovich Mendeleyev the time of realization of the significant research of scientific and applied nature. Here the amazing correlation of theoretical works of the scientist and their practical application became apparent.

Later his son Ivan Dmitrievich Mendeleyev wrote about his father, "I knew as though two Mendeleyevs. One of them was an assiduous collector of facts, a petty empiricist – Wagner of Goethe, for whom the highest pleasure was the treatment of the number, piling of the data, examination of interesting individual features of the phenomena. Another one was the valorous Faust, passing away to the "spirits' world", to the world of ideas, to the world of general laws..."

In 1861, at the suggestion of the "Public Good" Publishing House, D. I. Mendeleyev wrote a manual of organic chemistry, which became the first Russian textbook on this subject. The basis of this manual was the series of lectures delivered by him in 1857–1858. The book was written during the extremely short term and it caused the broad response in the scientific and public groups. Mendeleyev was awarded to a prize of the Academy of Sciences, and in 1863 the second edition of the manual was published.

Mendeleyev also started to edit the Technical Encyclopedia in many volumes "Technologies according to Wagner" (Wagner J.-R. Theorie und Praxis der Gewerbe: Hand und Lehrhuch der Technologie). Wagner's Encyclopedia was published in Leipzig in 1857–1860 and had a great success in Europe. First, D. I. Mendeleyev decided to make a translation only because of the lack of money. He remembered, "I started translating and completing

the "Technologies according to Wagner" because it was paid (30 rubles per sheet), but then I was interested and made many additions..."

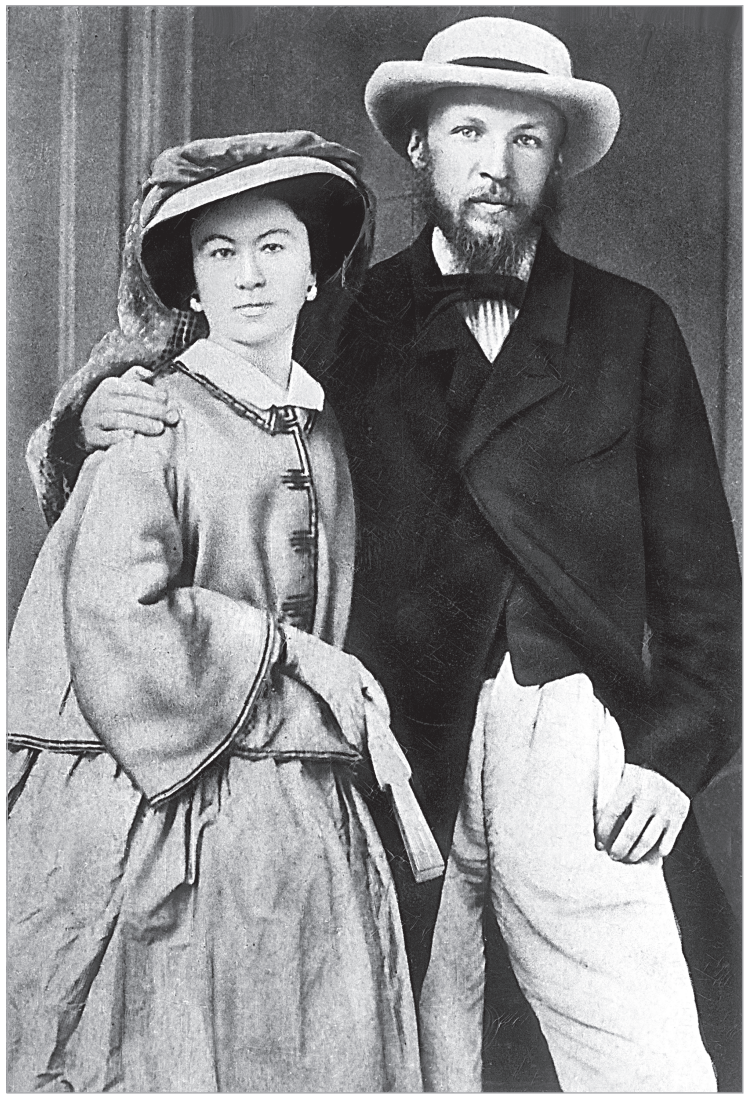
The work on editing this book took several years. Dmitry Ivanovich not just translated the "Technologies..." from German, but he made a large amount of adjustments, sometimes completing the book with his own chapters. After all, the "Technologies according to Wagner" played a significant role in the choice of the future subject of the scientist's research. In the third part of the "Technologies..." there were discussed the scientific and technological problems, connected with alcohol production. The practical importance of precise data about the density of alcohol-aqueous solutions and theoretical meaning of these data combined in this question. Density had been always considered by D.I. Mendeleyev as the most important parameter of substance. By the middle of the 1860's the scientist started paying less attention to the edition of the "Technologies according to Wagner" and was more and more concentrated on the research of the alcohol-aqueous solutions.

In 1863, in connection with the development of the technology of alcohol-aqueous industry, Mendeleyev started a new big series of science works on this subject. On the first stage he was constructing the instruments for defining alcohol concentration – alcoholometers. And on the next stage – the thorough research of relative density of alcohol-aqueous solutions in the whole interval of concentrations under several temperatures. This experimental work became the foundation of the Doctoral thesis, which was presented by him to the Council of Petersburg University at the end of 1864 and was defended by him in 1865.

The research "About the connection of alcohol with water" contains the basic regulations of Mendeleyev's doctrine of the solutions and it especially determines the existence of water and alcohol connections. Here are the results of measuring the density of aqueous solutions of ethyl alcohol with 35 to 100% of alcohol according to weight under five values of temperature (0°, 10°, 15°, 20° and 30 °C).

It is necessary to thank Dmitry Ivanovich Mendeleyev that Russia was possible to give the world its famous Russian vodka. V. Pohlebkin in his article, devoted to the Mendeleyev's research, wrote, "D.I. Mendeleyev, who had taken part in his time in the creation of the contemporary scientific technology of vodka production, insisted definitely on making the general official name "vodka" as the most exactly expressing the character of the drink.

Till the establishment of the vodka monopoly in 1894–1902, vodka had been produced very easily – by mixing up 50% of alcohol with 50% of water. Such a mixture gave 41–42° of alcohol in the drink. In order to get the forty-



Dmitry Ivanovich Mendeleyev and Theozva Nikitichna Mendeleyeva
(nee Leshchova; 1828–1905) –
the first wife of D.I. Mendeleyev. *1862*

degree vodka, it was necessary not to combine volumes but to weigh alcohol precisely. Mendeleyev proved that 40°, which is indeed never got by mixing up the volumes of the water and alcohol, but only by mixing up the precise weight ratio of alcohol and water, should have been acknowledged as the ideal content of alcohol in vodka.

Thus, one litre of forty-degree vodka should weigh exactly 953 g. The alcoholic content of the alcohol-aqueous mixture, weighing 951 g, will be 41°, and it will be 39° in case of weighing 954 g. The physiological influence

of such a mixture to organism becomes worse in both cases and, definitely speaking, both of them cannot be called vodka.

As a result of the research of D.I. Mendeleyev, since the end of the 19th century only product containing grain alcohol mixed by water according to weight exactly till 40°, could have been regarded as Russian (or rather – "Moscow") vodka. This Mendeleyev's structure of vodka was patented in 1894 by the government of Russia as Russian national vodka – "Moscow Especial" (first it was named "Moscow Particular").

As during the life of D.I. Mendeleyev his data were started to be used for the wine-making calculations in Austria, Germany and Holland.

In Imperial Russia the alcoholometrical tables were based on the archaic English and German data. The results of D.I. Mendeleyev were admitted later. In the 1920's the special commission of the Principle Board of Weights and Measures came to a conclusion that the work of Mendeleyev was precise to the maximum. In 1927 new alcoholometrical tables, the basis of which were the results of the scientist's research, were published.

From the very graduating the Main Pedagogical Institute, teaching took a considerable time of Dmitry Ivanovich Mendeleyev. Teacher's work of the scientist amazes by its breadth. At first, together with general, theoretical, organic and analytical chemistry he was teaching physics and physical geography. Students not just loved the scientist, they literally worshipped him. His appearance also made a great impression. He had never delivered his lectures smoothly, but always vividly, interestingly and informally, accompanying his words with an expressive mimicry. It was difficult to take exams to him.

Dmitry Ivanovich was teaching at the University, the Institute of Technology, the Institute of the Corps of Engineers of Communications, at the Nicholas Engineering Academy, the Nicholas Engineering School and at the 2nd Military School. Since 1871 he had been teaching chemistry at the Higher Female Courses. Later the number of the educational institutions, where Mendeleyev had been teaching, slightly reduced and he concentrated all his work mainly at the Institute of Technology and at the University.

Mendeleyev wasn't only teaching but he always took part in the public life of the educational institutions, quickly reacting to the changes, which had been made in the system of Russian education. The liberal reforms of the 1860's, which had been made by Alexander II, applied to the system of education in Russia and influenced the life of the University immediately. The statute of the University, signed by Alexander II on June, 18th of 1863, was the most liberal university regulation in Russia of the 19th – the

Portrait of D.I. Mendeleyev made by A.I. Mendeleyeva –
the second wife of D.I. Mendeleyev.
Oil, 1886

beginning of the 20th century. The statute gave autonomy to the higher educational institution. The University's board, the members of which were all the professors, became an independent institution. The Board had the right to choose the rector, pro-rector, deans and also professors for the vacant chairs. It was very important that the University's board got an opportunity to divide the faculties to the branches, to join and to divide the chairs, to change them and to define which subjects should have been considered obligatory and not obligatory for students.

Having become in 1867 the head of the department of general chemistry of the physico-mathematical faculty, Mendeleyev succeeded to separate out an independent course of analytical chemistry, which had been taught by N.A. Menshutkin. Thanks to Mendeleyev's initiative, A.M. Butlerov was invited to teach the course of organic chemistry from Kazan University in 1868. And since 1869 the chemical sciences were represented at the University by the three departments: of general and inorganic chemistry (D.I. Mendeleyev), of organic chemistry (A.M. Butlerov) and of analytical and technical chemistry (N.A. Menshutkin).

According to the Statute of 1863 the University got the right to establish scientific societies. Thus, Saint-Petersburg Society of Naturalists (1868), the Philological Society (1869) and the Physical Society (1872) appeared.

During these years D.I. Mendeleyev took an active part in the establishment of the scientific chemical society. There are notes in the diaries of the scientist of 1861–1862 about the meetings of the chemists which had become regular. At those meetings there were the majority of well-known chemists and representatives of the adjoining sciences, who worked in Saint-Petersburg. N.N. Zinin, F.F. Beilstein, L.N. Shishkov, A.A. Voskresensky, N.I. Koksharov, E.H. Lenz, B.S. Jacobi, etc. can be mentioned among them. It becomes clear from the diaries to what a great extent was the role of Mendeleyev in the establishment of the scientific chemical society. However, the dream of the scientist was realized only in 1868.

The work at the manual "The fundamentals of chemistry" takes an exclusive place in the life and activities of Dmitry Ivanovich Mendeleyev at the end of the 1860's. Right this work led the scientist to the discovery of the periodical law of chemical elements. Mendeleyev must have started to work at the text of the manual in winter of 1867–1868, using in the process of the work the stenograms of his lectures, made by the students. The book was published in separate editions, the first of which appeared at the end of May – beginning of June of 1868. Later Dmitry Ivanovich admitted that "The Fundamentals..." was his "dear child."

The desktop of D.I. Mendeleyev in his study at the University

During the process of the work at the schedule of the editions of the 2nd part Mendeleyev was gradually coming from grouping the elements according to their valency to their location according to the resemblance of their characteristics and atomic weight. In the middle of February of 1869 Mendeleyev, while keeping thinking over the structure of the subsequent chapters of the book, reached in real earnest the problem of creating the rational system of chemical elements. The determining stage came on February, 17th.

The scientist had been working when in the morning he was given a letter with the information about the supposed urgent trip to Tverskaya province. After having read the letter rapidly, he put the letter aside and kept comparing the different variants of comparing the elements of the natural groups according to their atomic weights. The papers cut into cards finished. A group of columns and lines, which became the starting point of the development of the table "The experience of the system of elements, based on their atomic weights and chemical resemblance", appeared on the back side of the received letter. During the day Mendeleyev was working over the compilation of "The experience of the system of elements..." In the evening he sent a clean copy of the table to the press having made the notes for the typesetters and having written the date "February, 17th of 1869."

There is a version that Mendeleyev saw "the system of elements" in his dream. He got up from a joyful excitement and wrote rapidly the table on a piece of paper. That's all. The scientist compiled a clear and harmonious building of the periodical system from the chaos of separate indigested chemical elements.

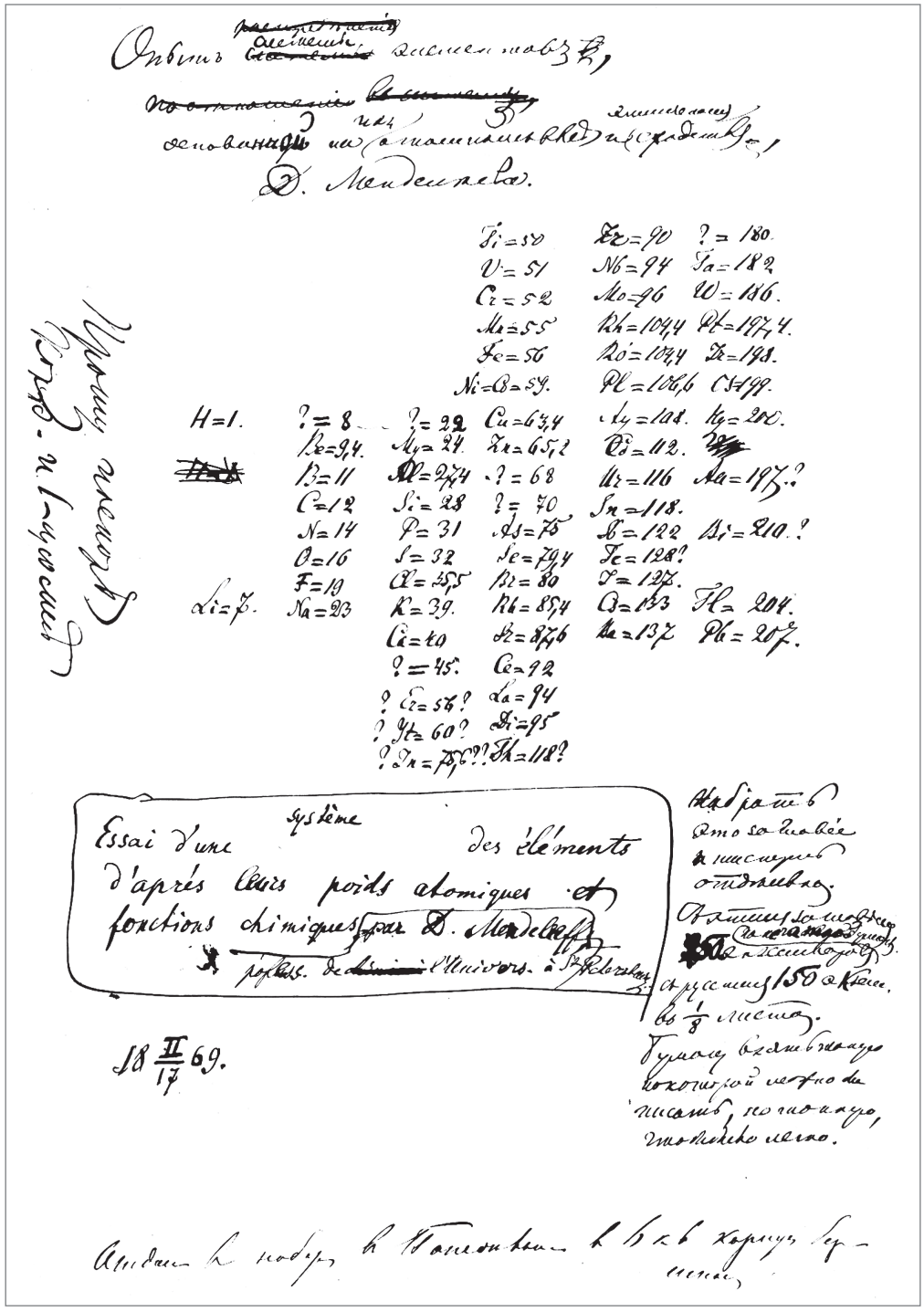
Dmitry Ivanovich utterly disliked talking with the strangers "about personal, subjective part of his feelings, about the preparatory period, when the ideas had been formulating and confidence that he had reached the one of the deepest mysteries of nature had been composed little by little." However, according to the testimonies of Ivan, his son in a second marriage, the scientist used to say that the year of 1860 had become for him the "determinative moment" in the establishment of the periodical system – the congress of chemists in Carlsruhe. And more specifically – the ideas expressed by Italian chemist S. Cannizzaro. D. I. Mendeleyev said, "I consider him to be my real forerunner, because the atomic weights defined by him gave me the necessary point of support."

In August of 1869, at the Second congress of Russian naturalists the scientist made a report "About the atomic volume of the simple substances", where he offered a short form of the table. Only In, the rare earth elements and several heavy ones: Au, Hg, Te, Bi, Th, U, didn't get any place there or were located incorrectly. The scientist kept working at the allocation of these elements.

D.I. Mendeleyev was writing about the 1870's, "This was a transitional time for me: many things had been changing in me then; I used to read a lot about religions, sects, philosophy and economical articles then."

At that time the aggressive extremist forces of the society livened up. Mendeleyev showed himself as an active public figure, longing for contributing to the salvation of the social problems of the country. Regarding it the article of the scientist, which had been written by him for the newspaper "Voice" in connection with the appeal of the government to Russian people calling for help in the struggle with extremism, but hadn't been published, is deserving attention. It was called "Response to the call." The scientist disputes against the "secret arrangements" of the government – secret investigations, prohibitions to read the "rebellious" literature, etc.

The growth of interest of the scientist to history, philosophy and literature contemporizes with the growth of activity in the socio-political sphere. However, Mendeleyev's "disposition to painting was coming out clearer than anything else." According to the testimonies of the contemporaries,



The manuscript of the table “The experience of the system of elements, based on their atomic weight and chemical resemblance”

he was "not a bad graphic artist." The Wanderers appeared to be closer to Dmitry Ivanovich than other different art schools. Namely their creativity corresponded with his realistic cast of mind.

Mendeleyev enjoyed travelling very much. During his foreign trips he had studied the main art galleries of the world. It becomes evident at the sight of his photograph albums and engravings. He didn't miss any art exhibition in Russia. The albums, made by Dmitry Ivanovich during the exhibitions of the painters-Wanderers, are of a special interest. Thus, for instance, in the archive of the scientist there was kept an album of photocopies mainly from the 6th exhibition of 1878.

Since 1878 meetings of painters and scientists, which were named later the "Mendeleyev's Wednesdays", started taking place at Mendeleyev's apartment: "There were constantly present all the Wanderers – Kramskoy, Repin, Yaroshenko, Myasoedov, Kuznetsov, Savitzky, Vl. Makovsky, P.K. Klodt, Maksimov, the Vasnetsovs, Surikov, Shishkin, Quindji, Kiselev, Ostrouhov, Volkov, Pozen, Lemoch, Prahov and Mihaltseva. Among the University professors there were more often than others Beketov, Menshutkin, Petrushevsky, Inostrantsev, Wagner, Voyeikov and Kraevich... They came to the "Wednesdays" without any special invitations."

The "Wednesdays" were the continuation of those scientists' meetings, the organization of which had been done by Dmitry Ivanovich during the previous years. Partly the establishment of the Association of the mobile exhibitions became an impulse for organizing the "Wednesdays."

The scientist was interested in photography and took the most active part in organizing the photographic reproduction of the paintings and in developing the corresponding equipment. At the end of the 1870's together with some painters and amateurs in photography he organized a group, the goal of which was the "use of photography in spreading the works of Russian art." The group, which had been gathering at Mendeleyev's apartment, joined the well-known Russian photographers: S. and L. Levitskies, V. Karrik, the inventor L. Varnerke, the young scientist V. I. Sreznevsky, etc. Namely here the idea of establishing in Petersburg the society of photography was born.

Except photographs and engravings, Dmitry Ivanovich was gathering valuable collections of art originals: drawings of Bruni, Ivanov, Fedotov, Repin, Quindji, Yaroshenko and Shishkin.

The painting of Quindji "Night at the Dnieper" not only made a great impression upon Mendeleyev, but also made him think about the questions

Saint-Petersburg University in the latter half of the 19th century.
Water-colour by N.B. Belyavsky after the old engraving.
Here D.I. Mendeleyev had been studying at the Main
Pedagogical Institute (1850–1855), teaching
(1857–1890) and living (1866–1890)

of the theory of art. On November, 13th of 1900 in the 314th issue of the "Voice" was published his small article "Before the painting of Quindji."

Mendeleyev wrote about a certain parallelism of the development of nature sciences and of the interest of artists for scenery: "They started studying nature, the natural science, which hadn't been known in the ancient times and during the era of the Renaissance, was born... The nature became not a slave, a frame, but a helpmate, equal with man, a wife for a husband... The inductive, experimental sciences using the knowledge of external and internal, reconciling the kingly metaphysics and mathematics with the humble observation and with a request for an answer to the nature, became the crown of knowledge... At the same time with this change in the system of knowledge – if not earlier – the scenery was born."

Making suitcases and frames for the portraits was another passion of Dmitry Mendeleyev, which became surrounded by legends and rumours. Mendeleyev always bought the materials for the work at Gostiny Dvor. Once, while choosing the necessary goods, he heard somebody asking behind his back: "Who is this respectable gentleman?" And the answer of the clerk: "It is necessary to know such people. This is Mendeleyev, a suitcase-maker." In general, Mendeleyev liked to paste. It was a rest for him as well as patience

or chess. He pasted very neatly and accurately, he sticked on the collections of photographs and engravings of Russian and foreign famous pictures, collected by him, he pasted cases for the albums and brochures, boxes, caskets, small travelling cases. His niece N.Y. Kapustina-Gubkina kept a folding traveling chess-board, made by Dmitry Ivanovich. The pasteboard figures were set into the special squares and they couldn't fall out of them on no jolting on the road. In 1895 Dmitry Ivanovich couldn't read and write after having had an operation of the cataract ablation: he had been read the papers aloud, he had been dictating the instructions to his secretary. And till his eyesight hadn't come back once and for all, Mendeleyev devoted his spare time to this passion, having presented all his friends with suitcases, boxes and caskets.

Mendeleyev paid pretty much attention to the scientific research of spiritualism. He studied the phenomena, happening during the spiritualistic sessions, as a scientist and pedagogue, as far as the passion for spiritualism by many professors of the University could have influenced the student youth. He suggested to establish the special commission for studying the spiritualistic phenomena, attached to the Russian Physical Society. Well-known physicists and chemists took part in it in addition to Dmitry Ivanovich: I.I. Borgman, N.A. Gezehus, N.G. Egorov, K.D. Kraevich, F. F. Petrushevsky, etc. While studying the "spiritualistic phenomena", the methods of natural sciences, instruments and calculations were broadly used. The conclusions of the commission were joined in the book, published by D.I. Mendeleyev, "The materials for commenting the spiritualism." The funds, made by selling this book, were meant for "making a big balloon and in general for the research of the meteorological phenomena of the top layers of atmosphere."

The versatility of personality and variety of interests of Mendeleyev are striking. But the scientist himself used to say so: "I respect one-sided talents, but, nevertheless, I consider them to be a certain abnormality. I like science most of all, but I think that I could have specialized in other spheres under the certain circumstances. I think that a normal person can orient everywhere."

Mendeleyev was depressed by the end of the 1870's. The state of his health had become worse. He had been taken ill with pleurisy and he had to go abroad for the treatment. Besides, his relationship with his wife Theozva Nikitichna was cooling down more and more.

In spring of 1877 his wife with the children goes to Boblovo. And the sister of Dmitry Ivanovich Katya comes temporarily with the children to his apartment. Anyuta Popova, the daughter of a Don Cossack, lived as a

guest with Nadezhda, the niece of Mendeleyev. She studied at the Conservatoire in the class of piano; she visited the painting school attached to the Academy of Arts. Infatuation of Dmitry Ivanovich for her grew into love. However, Anyuta was more than 20 years younger than Mendeleyev. They were called Faust and Margaret behind their back.

Dmitry Ivanovich suffered deeply while struggling with his feeling. He considered necessary to tell everything to father of Anna Ivanovna, and the last one asked him not to meet with Anyuta anymore. The girl went abroad, but Mendeleyev followed her to Rome. In 1881, after having returned, he wrote to Theozva Nikitichna: "Yesterday I came back to Petersburg with Anna Ivanovna and her father Ivan Eustacievich...

My position is clear and specified already by this. If nothing extraordinary happens, it will stay being like that, and I will stay at the University, I will start lecturing and working as usual, and, in addition, I will solicit to have funds for 2 families." "We've lived, we will stay being friends though not in one house."

Theozva Nikitichna hasn't agreed for the divorce for a long time. The marriage was dissolved only in 1881. In winter of the same year Lyuba, the daughter of Anna Ivanovna and Dmitry Ivanovich, was born. They could get married only in 1882. After the wedding the Mendeleyevs settled in the university apartment. Here their younger children were born later: a son Ivan and twins, Maria and Vasiliy, who were called in honour of the mother of Dmitry Ivanovich and his uncle Vasiliy Kornilyev, who had done many things for the Mendeleyevs in his time.

This period was a hard one for D.I. Mendeleyev also by another reason. It seemed to him that he didn't have enough energy in order to realize his creative potential sufficiently. However, he kept working, and the periodical law, discovered by him, got more and more followers among the scientists of the world.

From the very beginning appeared the question of the priority of the discovery, started by the number of English and German scientists: W. Odling, L. Meyer, etc., in connection with the fundamental importance of the law. Mendeleyev devoted his publication "To the question of the system of elements", which appeared in the "Reports of German Chemical Society" in 1871, right to this problem. In his small article the scientist mentioned the most important stages of his discovery and suggested for the first time to call his system periodical, because of the periodical law being its basis: "The measurable chemical and physical characteristics of

the elements and their connections depend periodically on the atomic weights of the elements."

The article "The periodical legality of the chemical elements", which was the result of more than two years of work of the scientist, was published in 1871 in the "Annals of Pharmacy" ("Annalen der Pharmacie"), the oldest chemical magazine, founded in 1832 by the German chemist J. Libich. That is the evaluation of this article by Mendeleyev at the end of the 1890's:

"This is the best code of my opinions and considerations about the periodicity of elements and this is the original, according to which there was written so much about this system. This is the main reason of my scientific reputation..."

In the same article the scientist gave the criterion of the solidity of the laws of nature in general: "Every law of nature gets the scientific meaning only in case that it, so to say, allows practical consequences, i. e. such logical conclusions, which explain unaccounted and point to the phenomena unknown before, and especially if the law leads to the predictions, which may be checked by experiment. In the last case the meaning of the law is evident and it is possible to check its equity, which at least impulses to the development of the new spheres of the science."

By applying this thesis to the periodical law, he mentioned the following opportunities of its application: 1) to the system of elements; 2) to the definition of the characteristics of yet unknown elements; 3) to the definition of the atomic weight of scantily explored elements; 4) to the correction of the values of atomic weights; 5) to the renewal of the data concerning the forms of chemical compounds. Besides, Mendeleyev pointed to the possibility of "application of the periodical law: for the correct idea of the so-called associated compounds; for the comparative research of the physical characteristics of simple and compound bodies." Mendeleyev thought when the physical sense of the periodical law would have been understood and the essence of the elements' distinction would have been discovered on this basis, "then, certainly, chemistry would be able to leave the hypothetical field of static ideas, which are dominating there nowadays, and then there would be an opportunity to place it under the dynamic direction, which is already applied productively enough to the study of most of the physical phenomena."

It is possible to say that the scientist outlined by this article the broad programm of the research on the subject of inorganic chemistry, based on the law of periodicity. Indeed, many important directions of inorganic chemistry were developed actually at the end of the 19th – beginning of the 20th century according to the ways, designed by D. I. Mendeleyev.

In March of 1879 there was an important event, which promoted the further consolidation of the periodical law in the science: the Swedish chemist L. Nilson told about having discovered scandium, which appeared to be the same with ekabor of Mendeleyev. However, L. Nilson defined the chemical nature of scandium incorrectly first, holding that the new element should have been placed for certain between tin and thorium in the periodical system. The identity of scandium and ekabor was clearly determined in August of 1879 by the countryman of Nilson P. Kleve. And in 1880 L. Nilson admitted the rightfulness of P. Kleve.

Thus, if the discovery of gallium by P. Lecock de Boibodrant in 1875 only confirmed the opportunities of the periodical system, the discovery of scandium made the chemists look at it as at a strict scientific generalization of data and facts, as to the guide to the further research of chemical elements. In 1884–1887 the periodical law became consolidated and was acknowledged by the vast majority of those scientists, who hadn't made a proper account of it or ignored it at all.

In 1884 the "problem of beryllium" was finally solved. Up to that moment there hadn't been any united standpoint concerning the valency of this element and the value of its atomic weight. On April, 17th (5th) L. Nilson wrote a letter to Mendeleyev, where he was stating all the data concerning beryllium and was warmly congratulating him with the fact, "that also in this case, as in many others, the system justified itself." The discovery of the new chemical element germanium in the rare mineral argyrodite, made by K. Winkler in 1886, became an especially important event of that time in the fortune of the teaching of periodicity.

That was the triumph of the periodical system of elements. It was totally acknowledged by the scientific world. And Mendeleyev himself reacted to the discovery of germanium in a very unusual way: in May of 1886 he made a special photomontage of the "consolidators of the periodical law." This photomontage, pasted to the mat, consisted of four portraits: P. Lecock de Boibodrant, L. Nilson, K. Winckler and B. Browner. On the back side, in front of each portrait, there were made notes by the hand of Mendeleyev, which were briefly characterizing the accomplishments of the scientist.

The authority of D.I. Mendeleyev was growing among the scientists of the world. However, everything wasn't so easy in Russia. The news about D.I. Mendeleyev having got married to Anna Popova without having had divorced with the first wife caused many rumours and gossips. It was even rumoured that the actual bigamy of the scientist became the reason of

Dmitry Ivanovich's having not being elected to the academy. A joke even was said during those years: when one of the generals applied to the emperor with a request to give him a permission for the second marriage, Alexander III refused definitely. And when the general reminded that Mendeleyev had had two wives and nothing had happened, the emperor answered: "That is true, that Mendeleyev has two wives, but I have only one Mendeleyev." But, certainly, there was another reason of Mendeleyev having not been elected to the actual members of the Academy of Sciences. The scientist's relationships with the officials in the government as well as in the scientific circles were far from cloudless. Mendeleyev himself after having visited once the Ministry wrote in his diary: "Never have I been to put on airs, to kowtow before anybody, and it is necessary for them to do both, there isn't any middle. May their kingdom flourish – it isn't a place for us – it is humiliating, it is bad to become trivial with them, you want to cry and anger is overcoming."

The question of electing Mendeleyev to the actual members of Petersburg Academy of Sciences was raised at the beginning of 1880. Naturally, the scientific activity of D. I. Mendeleyev was connected from the very beginning with the Academy. He had many friends there: J.F. Fritzsche, N.N. Zinin, E.H. Lenz, A.M. Butlerov, etc. The articles of Mendeleyev were being published repeatedly in the editions of the Academy of Sciences. In 1876 D.I. Mendeleyev was elected a Corresponding Member of the Academy of Sciences without any specific difficulties. The candidature of D.I. Mendeleyev was suggested by G.P. Gelmersen, N.I. Koksharov, F.B. Schmidt, A.V. Gadolin and A.M. Butlerov. 17 from 20 presented voted for him. It is possible to explain the success of the elections also by the impression, which had been made upon the scientific world by the discovery of gallium by Lecock de Boibodrant.

In March of 1880 there was established the commission attached to the Department of Physico-Mathematical Sciences, which was to nominate the academician candidates to the chair of technology and chemistry. The fact is that at the beginning of February of 1880 academician N. N. Zinin died. The "chair" of the academician "in the sphere of technology and chemistry, adapted to the arts and crafts" became empty.

Butlerov, Koksharov, physicists Wield and Gadolin were the members of the commission. Butlerov nominated two candidatures: D.I. Mendeleyev and professor N.N. Beketov from Kharkov University. Both scientists were at the chairs of "pure" chemistry at the universities and formally couldn't

claim to the vacant post of academician at the chair of technology and chemistry. But Butlerov hadn't found worthier candidature. The commission hesitated in the choice between the two scientists. Beketov had learned about it and agreed that it was necessary to nominate Mendeleyev in that case.

While characterizing the candidature of D.I. Mendeleyev, academicians A.M. Butlerov, P.L. Chebyshev, N.I. Koksharov and F.V. Ovsyannikov noted his extraordinary accomplishments in the science: "Professor Mendeleyev takes first place in Russian chemistry, and we dare to think, sharing the general opinion of Russian chemists, that the place in the primary class of the Russian empire belongs to him by right. By adding professor Mendeleyev to its milieu, the Academy will honour the Russian science and, therefore, itself as its spiritual representative."

Mendeleyev started preparing the speech, which he was to pronounce after the election. The speech was named "Which Academy do we need?". The necessity of changes was its main topic.

Indispensable secretary of the Academy of Sciences K.S. Veselovsky tried to disrupt the balloting. He advised the president F. P. Litke to use the "veto" so that the elections would not have taken place at all. However, the elections took place in November of 1880. 18 people took part in it: 16 members of the physico-mathematical department, the president who had had two votes and the indispensable secretary. Exactly the half of the staff of the Department of physico-mathematical sciences seconded the candidature of Mendeleyev. The University scientists were the supporters of the election: A.M. Butlerov, P.L. Chebyshev, N.I. Koksharov and A.S. Famintsyn. Indispensable secretary of the Academy K.S. Veselovsky was one of the main opponents. Mendeleyev lacked four votes to become an Actual Member of the Academy of Sciences. The academic majority has blackballed the scientist.

The paper, where the approximate allocation of the forces was written by the hand of Butlerov: "It is evident – the black ones: Litke (2), Veselovsky, Gelmersen, Schrenk, Maksimovich, Strauch, Schmidt, Wield and Gadolin. The white ones: Bunyakovsky, Koksharov, Butlerov, Famintsyn, Ovsyannikov, Chebyshev, Alekseev, Struve and Savich."

The voting against Mendeleyev broadly echoed in the press. The question of the reasons of having not elected the scientist to the members of the Academy of Sciences is rather disputable. The contemporaries mentioned different versions: "intrigues of German party", a difficult temper of D.I. Mendeleyev, a competition between the Academy of Sciences and Saint-Petersburg University. It is also necessary to take into consideration the fact that the

periodical law was one of the items, according to which Mendeleyev was recommended for academician, hasn't absolutely consolidated in the scientific world and raised certain doubts yet.

Protests from different institutions and organizations fell to the Academy of Sciences. Mendeleyev received hundreds of sympathetic letters. During the small period after having been blackballed Mendeleyev got about 20 diplomas of the status of honorary member of the number of Russian universities and scientific societies.

Dmitry Ivanovich took hard the failed elections for academician, though the general attention and reaction of the press seemed to worry him more. He wrote in his letter to an old friend of him, the professor of the University in Kiev, P. P. Alekseev: "...I didn't want to be elected to the Academy, I would have been discontent with it, because they don't need there what I may give, and I don't want to reorganize myself anymore. There is neither foreign pomposity, solid firmness in the object of studies, nor the affected religious rite in the temple of science may be in me, if it had never been." Telegrams and sympathetic letters worried Mendeleyev. However, later Dmitry Ivanovich came to a conclusion that he was only a cause, thus, it was expressed "the wish to change the old with something new, but with its own...". And he was ready to help "to transform the fundamentals of the Academy to something new, Russian, his own...".

Unseldom the scientist had to overcome the hard periods of failures, misunderstanding and aloofness, arousing in him pessimism, tiredness and unbelief in his own strength. During one of such periods, in spring of 1884, he wrote a pathetic letter to the children from his first wife, Olga and Vladimir, a peculiar instruction for life, full of love to the children, and at the same time a will. The letter ended with the words: "...live with God, labour and truth. It's time me had a rest, it's time, farewell..."

By the twist of fate, rejected as a member of Petersburg Academy of Sciences, the scientist was unanimously elected at the beginning of the 1890's as a member of the Russian Academy of Fine Arts.

D.I. Mendeleyev did a lot in the sphere of economy and industry of Russia.

He was always in earnest about agriculture and during a period he was making experiments at his plots in the estate of Boblovo. His niece N. Y. Kapustina-Gubkina wrote that during the first years after Dmitry Ivanovich had purchased the estate, he "took a great interest in his

agricultural experiments." There was fenced off a so-called experimental field with the samples of different fertilizer. The experiments gave a brilliant result. The peasants were amazed: the crop on the experimental field got above twice and three times the harvest on their fields. Kapustina-Gubkina remembered that once the peasants came to Dmitry Ivanovich with a question. After having finished the work, they couldn't help asking about what had amazed them so much: "I say, Mitry Ivanych, your bread has grown so good over the Arzhany pond... Is it your talent or fortune?" The eyes of Dmitry Ivanovich flashed gaily and clearly, he grinned cunningly and said: "Certainly, brothers, the talent." Sometimes he liked to talk to the peasants in their "vulgar manner", and, according to the recollections of Kapustina-Gubkina, he did it very naturally, it suited very much "his Russian face."

After some time the agricultural experiments in Boblovo were stopped because of the lack of time, but Mendeleyev applied to economic, agricultural and industrial problems of a larger scale.

Later he will say in his work "To the knowledge of Russia": "In my life I had to take part in the fortune of three...affairs: oil, coal and iron-ore." During the period of 1880–1883 he applied to chemistry, technology and economy of petroleum industry.

The scientist made the laboratory research on sublimation of petroleum at the Konstantinovsky factory of V. I. Ragozin near Yaroslavl. Under the observation of Mendeleyev at this factory there was made a special device, with the help of which the scientist was testing the organization of the continuous sublimation of petroleum.

While working in the "petroleum sphere", Dmitry Ivanovich published the number of economical works. The main ideas, expressed in the economic works of this period ("The Letters about the factories", etc.), come to the following. The industrialization of Russia at the present stage of its development is a historical necessity. The number of peculiarities of economic and geographical state of Russia – the underdeveloped natural resources, idle manpower or usable only seasonally, capacious home market of Russia itself and also of the neighbouring Asiatic countries, remoteness of many regions from the harbours and the rise in prices of imported hardware as a sequent of it – creates opportunities for developing the national industry.

D.I. Mendeleyev also studied the questions of economy of the coal industry. On the instructions of the government he studied the reasons of its

crisis in the south of Russia. During winter and summer of 1888 Dmitry Ivanovich was in Donbas thrice, he learned the state of affairs at the main entrails, visited many mines and factories. He expounded the results of his trips in the number of official documents; he made reports at the meetings of Russian physico-mathematical society and broadly illustrated in a large publicistic article "The future power, resting on the shores of the Donetz."

During the process of studying the industry of Donbas Dmitry Ivanovich came to a conclusion that the development of Russian industry was hampered by an incorrect correlation of the stuff export and the finished hardware import. After the trip to Donbas he started active work on the revision of the customs-tariff, into which he put many efforts. The result of it was the book "Perspicuous tariff, or the Research of the development of industry of Russia in connection with its general customs-tariff of 1891."

In the book "Perspicuous tariff" the analysis of different systems of political economy is given, the customs policy of west-European countries is being examined, and first of all of England. A great importance is given to the history of the customs policy of Russia beginning from the 16th century.

The main idea of Mendeleyev – the use of industry – underlies his theoretical views. "Industry is a necessary link of the contemporary life of people at all steps of their development... It is necessary to put up with the participation and meaning of importance as with the structure of air and water, as with the necessity to live and die." "If twinkling of the dawn of that future world and of the rightful allocation of prosperity, possible for countries and people, is visible ahead – just by means of the same industry, because the experience of history showed the inadequacy neither of the concentrated effort of the military power, of various forms of landed property nor of the highest development of enlightenment, especially since it is still drawing inspiration of the most pugnacious and reasoning classicists for reaching this gospel direction..."

At the same time D.I. Mendeleyev was seriously interested in the problems of aerostatics and meteorology. In summer of 1887 he made a famous flight on a balloon, organized by the Russian technical society. The flight took place during the solar eclipse. The scientist was attracted by the opportunity to observe the corona for the first time during this phenomenon.

Mendeleyev was preparing seriously this important experiment. He suggested, e.g. to use for flight a balloon, filled not with a coal gas, but with the hydrogen, which provided the raise to the big height and, therefore, guaranteed the success of the observation.

On August, 7th, in spite of the early morning-hour, an enormous crowd of people gathered at the place of start of the balloon, near Klin: scientists, close friends of Mendeleyev and just those, who wished to see this exciting show. It was supposed that Mendeleyev and pilot-aeronaut A. M. Kovanyko would fly. However, the balloon became wet because of the bad weather and appeared to be unable to raise two people. Mendeleyev flew alone. Mendeleyev wrote in his notes about the flight: "...however, I should explain the reason why I had an immediate determination to travel alone, when it turned out that the balloon wasn't able to raise both of us... Understanding that we, professors, and scientists in general, are considered everywhere to be able to say and advise but not to be able to manage the practical work, that we, the Shchedrin's generals, always need a peasant to do something otherwise we are all fingers and thumbs, – played a great role in my decision. I wanted to demonstrate that this view might be fair in some other cases, but unfair regarding the naturalists, who are passing their lives in their laboratories, at the excursions and in the research of nature in general. We should certainly be able to manage practice... and there was an excellent opportunity for it."

The air-balloon raised high not enough and the sun was partly covered with the clouds, nevertheless, the scientist described the shape, color and the size of the corona in his essay in details.

Since Mendeleyev had lifted and landed the balloon skillfully, many people started talking about the coincidence of happy chances, which had allowed to make the flight so successful. Mendeleyev couldn't agree with such an explanation and added to the famous words of Suvorov: "Good luck, God forbid, good luck" – "There is something necessary except it. Both beauty, if not always, but most often corresponds to the high measure of advisability, and good luck – to the calm and completely reasonable attitude to the goal and means."

In the middle of the 1880's serious changes in the system of higher education happened again. The liberal Charter of the University existed till 1884. On August, 23rd Alexander III signed the bill of the minister of public education I.D. Delyanov about abolishing the "liberties of 1863." The law liquidated the autonomy of the University and placed its life under the care of the minister and of the curator of educational district. Essentially the charter had put big obstacles on the way to the perfection of education and to the development of science in the universities. The system of higher education obeyed even more the State, the social staff of the student

organisation was being changed. Most of the professors of Petersburg University sharply disapproved the university counter-reform.

During the period of preparing the charter Dmitry Ivanovich Mendeleyev still sharply objected to it. He thought that the maximum openness of the defences and publication of positive and negative responses was necessary. "On the whole, he wrote, the "new" Charter of the University has deprived the universities' boards of the former trust. It is impossible to build the enlightenment properly without trusting the general staff of the professors." The Ministry of Public Education started limiting visibly the activity of Mendeleyev within the precincts of Petersburg University, obstructing his work. The scientist saw that the University was giving him less and less opportunities for realizing his ideas. He started accomplishing big deals and beginnings outside the University more and more often, which finally prepared his leaving.

The information about the threatening student meeting at the University appeared in home notes of D.I. Mendeleyev on March, 13th of 1890. Professors A.A. Inostrantsev and V.V. Dokuchaev made him a request to call the students for peace in case of need. Mendeleyev agreed. On March, 14th he spoke to the students, suggesting them to go away, but while understanding the correctness of many requests of those who had gathered at the meeting he addressed to the Minister for Public Education I.D. Delyanov and told him about the requests of the students. On March, 15th he persuaded the students before the lecture to give him the petition written by them in order to deliver it to the minister.

From the petition of the students to the Minister for Public Education:

"We want the charter of the universities and other high educational institutions to be based on the principles of autonomy – so that the rector and professors would be elected according to the Charter of the university of 1863, so that the university and student court would have been established...so that all the graduates of high schools regardless of religion, social position and without any secret characteristics from the direction of gymnasium and police would have a free access to the University...We are sure that the freedom of teaching will be given to our professors along with it..."

As we may see, those were the requests for the democratization of the university education, which were usual for that time. However, on March, 16th minister Delyanov returned the petition to Mendeleyev with a decision of inability of its consideration. Mendeleyev needed three days in order to make a straight-out decision – to leave the University. While speaking for the last time from the pulpit at the University, he finished his speech with

the words: “I humbly ask you not to accompany my leaving with applause because of many reasons.”

Ivan Mendeleyev wrote in his memoirs about his father: “Essentially... this episode was only the last, exasperating drop. The break of father’s teaching was, according to his later words to me, as a matter of fact already prejudged after the reactionary university “reform”... – the reform, which was considered by father as a fatal one, as well as the reform of the high school, the basis of which was the formally understood “classicism” with the destroying serration of “Latin” as the main educational mean.”

After having left the University, the scientist has rented a new apartment. It wasn’t easy to move to it: so many boxes of books and manuscripts, artistic albums and folders with letters were collected that during the removal they filled almost the whole square near the University porch.

Dmitry Ivanovich sought to find an apartment not far away – on the Vasilyevsky Island, at Cadet Line, in the beginning of which the military school was situated. In the house, which belonged to Robert Lingen (now No.9 Syezdovskaya Line), he took apartment No 4 on the third floor. The removal took place on August, 21st–23rd of 1890.

Leaving Petersburg University in summer of 1890 broke more than 30 years of teaching activity of the scientist. During the long period of time D.I. Mendeleyev was working actively as a teacher in different high schools and educational institutions, he took an active part in the development and discussion of the universities’ charters of 1863 and 1884, he took part in the organization of special technical and business education, he studied the position of education in the universities of Edinburgh, Upsal and Yurieff. It let him say at the end of his life: “Teaching took the best period of my life and its main power.”

D.I. Mendeleyev has developed his own conception of education.

The question of public education was one of the “most critical” ones in Russia at the end of the 19th – beginning of the 20th century. The scientist addressed to it during different periods of his long-term teaching activity. The idea of continuous education, expressed by him for the first time in the “Essay on the subject of reforming the gymnasia” (1871), is the basis of Mendeleyev’s conception.

D.I. Mendeleyev put a question of the fundamental change of the educational content – “the change of classicism with more vital knowledge.” He understood it as the allocation of exact and natural sciences through the higher, secondary and then the “lower” school.

If education at the primary and secondary school, according to the point of view of Mendeleyev, is called to promote the personal development of a pupil, the state and public development should be the goal of the higher education: "Verily educated person, as I understand him in the contemporary sense, – concludes the scientist, – will find its place only at that time when the government or industry, or generally speaking the educated society need him with his independent opinion; otherwise he isn't wanted here and the "Grief from the mind" was written about him."

Dmitry Ivanovich expressed his understanding of the role of the university and the essence of the higher education in the "Report of the state of Saint-Petersburg University and the activity of a scientist of his class during the year of 1867", prepared by him in 1868 for the annual solemn act. The work, connected with the University, is characterized by the scientist as an activity of a peculiar kind: "Only the smaller part of the results of this activity is clear, it is possible to estimate it more or less, the other part is imperceptible, it is possible to point at it, but it is impossible to express it in numbers. It is impossible to calculate neither the number nor the quality of the labour, which consists of reading and learning of lectures, in arousing love for the labour, truth, light and science, which is the first goal of the universities... otherwise the universities would have sunk in the public estimation, they wouldn't have had their own position."

D.I. Mendeleyev defines teaching activity as one of the "national needs." In contrast to the other specialists, "having different applications of scientific beginnings to the vital needs as their subject", the teacher, while being "a specialist in a certain subject without fail", should have general philosophical viewpoint, otherwise, from the point of view of the scientist, he "can't influence beneficially, which is expected of him." Besides, the teacher himself should be continuously in the state of search and he should improve his knowledge of science: "Professor, who is only delivering the series of lectures, but not working in science and moving forward himself, – isn't only useful, but directly harmful. He will inspire the destroying spirit of classicism and scholasticism into the beginners, he will kill their living aspiration."

The conception of education was stated by D.I. Mendeleyev in the work "The Project of the School of Tutors." Mendeleyev includes a wide range of disciplines, encircling almost all the spheres of knowledge, in his program of training for the School of tutors. He divides them to general subjects, mainly having pedagogical and historico-philosophical character, to theoretical subjects, corresponding with the subjects of high schools, and to applied

sciences, where he names agriculture, technology, mechanics, chemistry, etc. Though the most part of the graduates (after having studied for four years) becomes teachers of gymnasia and schools, the most gifted should have an opportunity "to improve and to study independently, being considered as candidates for professors."

The subject of commercial and technical education attracted the attention of the scientist to the great extent and was reflected both in many works by him and in his activity in general. As it has already been said, the scientist thought that the time of classical education became the thing of the past, that only "reasoners, who are strangers to the active life and to the reality" may grow because of it. While resting upon his long-term experience of a teacher, Mendeleyev saw the decision of this problem in an organization of the new faculties attached to the universities. The 2nd Congress of Russian promoters in technical and professional education (1896) supported this proposal of the scientist by writing in its resolution the request of increasing the number of the chairs of applied sciences attached to the physico-mathematical faculties of the universities.

Mendeleyev took an active part in the establishment of the higher technical educational institutions: the first polytechnic – Kiev Polytechnic Institute, Tomsk Technological Institute, etc. He paid a great attention also to the creation of the commercial education in Russia, taking part in the meetings of the Board of educational affairs attached to the Ministry of Finance.

In 1895 in his report "About the development of the secondary and higher education", directed to the minister for finance S.J. Witte, Dmitry Ivanovich wrote on the assumption of the fact that the development of industry and education was in close and evident connection: "The future power of Russia may correspond with its contemporary strength only on condition of the prosperity of enlightenment and development of its industrial capacity, which is the part and parcel of the reasonable vitally real enlightenment."

The chronicle of the life and activity of Mendeleyev of the beginning of the 1890's is the evidence of the fact that leaving the University hadn't practically affected the intensity of his scientific and practical activity. Already at the end of March of 1890 he forwards the petition to the Main office of press to give him a permission to publish a political-literary newspaper, he makes up an estimate of initial expenses for the edition of the first issues, he negotiates with the manager of the Naval Ministry concerning the organization of a special laboratory for studying the explosives. In May

he finished his report for the Proceedings of the Congress of Russian Naturalists and Physicians. His rhythm of life is the same, D.I. Mendeleyev keeps working in the sphere of natural sciences, economy, he takes part in social and political life.

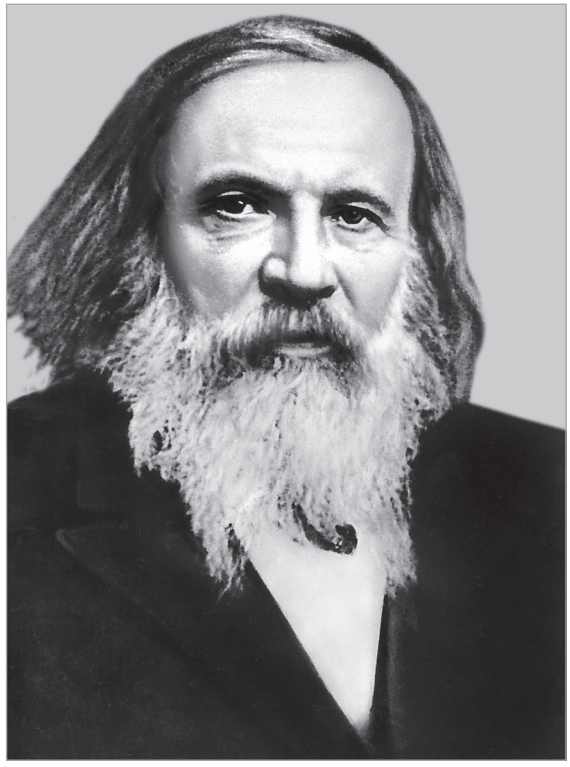
Ivan Mendeleyev wrote: "Most of all...I'm amazed with an unusual capacity for work of my father. I don't remember him having rest, being idle. He smoked even as if it was mechanically during the work, rolling up unconsciously cigarette after cigarette, which he threw half unfinished..."

"The keeper of measures and weights"

"The science starts since it is being measured. The exact science is impossible without measure." These are the words of D.I. Mendeleyev, the activity of whom after having left the University was most of all connected with metrology and organizing the verifying affair in Russia. And it is quite naturally, all the previous experience of the scientist led to it. He started every research from laborious and colossal work on gathering and manufacturing the separate facts. "First of all give me a number", – he used to say jokingly to the colleagues and visitors. The development of each topic, to which Mendeleyev addressed, started from thorough preparation of the opportunity of exact measurement and as a result it led to the creation of unique measuring devices.

Mendeleyev had come across the problems of precision even at the eldest year of the Main Pedagogical Institute, when professors S.S. Kutorga and A.A. Voskresensky suggested him a topic for a little research, devoted to a chemical analysis of the orthite and pyroxene minerals, and later the topic of dissertation, connected with isomorphism. Since then the question of validity of any results of scientific research was always connected for him with the problem of verification of measuring equipment and used measures. Practical work proved useful for the future "keeper of measures and weights", the creator of the Main House of Measures and Weights in Russia. Here Dmitry Ivanovich had been realizing many ideas, developed by him earlier. In 1899, while commenting his doctoral thesis "About the compound of spirit and water", Mendeleyev wrote: "...This work was worth being repeated having the means, which I have now at the Main House of Measures and Weights."

By the middle of the 1880's metrology started gaining not only in a big scientific, but also in practical national importance. The question of the



Dmitry Ivanovich Mendeleyev

standards of the main physical values (first of all, mechanical ones) was of primary importance in the era of the development of industry and commerce, of the expansion of the communications. Metrology united science, technics and industry. Such problems were combined in this sphere, that personality of Mendeleyev, joining the knowledge, talent and will, was right for studying and solving them most of all. Intellect of the highest level, love for the precise metrology and reliable calculations, feeling for construction, managerial abilities and knack of persuading the officials of the high rank to carry out his plans – all this spoke well of the scientist.

Another circumstance was important. While studying the particular questions of metrology almost during all his scientific activity, Mendeleyev was ready by that time to start solving two problems: general one – creation of the scientific metrology and practical one – organization of manufacturing the main measures, creation of the extensive network of verifying institutions on the territory of Russia.

In 1890 the Minister for Finance I.A. Vyshnegradsky told D.I. Mendeleyev about the complaints of false measures and cheating in weighing and he lamented for the inability of the Depository of Measures and Weights to establish order to the verification, control and supervision of measures and weights. He got the answer of Mendeleyev in response, the sense of which was that they themselves made a museum of wonders of the Depository but want the museum workers to put in order living work.

In autumn of 1892, after scientist's leaving the University, the minister offered him an appointment at the Depository of Measures and Weights. Mendeleyev agreed easily to develop the package plan of structural and scientific nature and to prepare proposals for transforming the Roundhouse to the metrological institution of a new type. By the middle of November the appointment was submitted to the approval of the academical authorities, the government and was highly approved by the tsar – since November, 19th started the state service of Mendeleyev in the capacity of an "academic keeper" of the Depository of standard Measures and Weights. D.I. Mendeleyev tackled metrology in real earnest. He explained his passion like that: "...the pure science here was getting mixed up closely to the practical one."

In 1893 the Ministry of Finance submitted a proposal of transforming the existing Depository of Measures and Weights to the Main House of Measures and Weights, which had been developed by D.I. Mendeleyev and signed by the Minister for Finance S.J. Witte, to the Council of State. The

members of the State Council didn't want to call the House "Main." Only the authority of Mendeleyev helped to improve the situation. The House should have had to become the central verifying institution of the country. The Council didn't meet any obstacles on the way to the approval of the proposals and decreed by the assessment, which had been highly approved on June, 8th: "...to let the Minister for Finance, together with the revision of the current regulations of measures and weights, enter into the closest discussion of the question of organizing control over the verification in the provinces and in the spheres of commercial measures and weights..." The task, entrusted to the ministry, broke up into two parts:

1) the reconstruction of the prototypes of Russian measure and weight units;

2) the revision of the current laws concerning measures and weights. I.e. "the keeper of measures and weights" was to start creating the system of the houses of samples and weights and establishing the institute of specially prepared verification officers.

At the new post Mendeleyev revealed big administrative gifts, the possibility to solve problems upon the state level. From the very beginning he came across the implacable system of procrastination. The Main House of Measures and Weights, created by him on the basis of the Depository, submitted to the Department of Commerce and Manufacturing of the Ministry of Finance. In spite of the big benevolence of the Minister S.J. Witte to the scientist, anyway the assessment of the department was necessary for solving some certain questions. The document, sent with the courier from the House, was at the Department for a week. Or – what was worse – the cases were lying too long, being delayed and accumulated. First Mendeleyev struggled according to rigidly patriarchal and stringently ruled family life – he "taught."

One day he took the carriage, went to the department and raged and fulminated there. They were sincerely afraid of him, apologized, promised to speed up the cases – and speeded up. But in two-three months Mendeleyev had to go there once more.

This way of struggling with procrastination seemed to be hard for the scientist, and he found a new, very original and sly one: he invited the head of the bureau from the department only for two hours a day to serve at the House, he gave him a good salary – and the things started going on swimmingly. After having come to the House at 11 o'clock, the departamental official was sitting down to the table and writing some documents for himself; he got any sign he needed, put the papers into the vest pocket and went to the department. There he was getting the documents on his table already,

writing the prepared response, bringing to report it to the director of the department and the next morning was bringing the fastened response back to the House.

Mendeleyev, while being an original and independent person in his decisions, required the same of his colleagues. He appreciated most of all namely the independence and irregularity of the approach and the possibility to solve the most difficult tasks. When M.N. Mladentsev, after just having finished the University, started working with Dmitry Ivanovich, he let him make a special map of Ural as the first task.

– But I hadn't studied cartography, – Mladentsev became confused.

– I don't need colleagues who can do only what they had studied. Make the map or go away, – followed the severe answer.

The map was made and published as an appendix to "The iron industry of Ural" of D.I. Mendeleyev.

Mendeleyev pointed out in his note of the necessity of renewing the prototypes, directed to the Department, that it "was caused by the practical and vital necessity of our country to improve measures and weights, because the industrial and commercial state of Russia needed special attention in this difficult and hard case, which is only starting from renewing the prototypes." D.I. Mendeleyev wrote, that "the main prototypes of measures and weights of the empire require immediate renewal for putting them to the state of the possibly lasting invariability."

Mendeleyev called for witness the experience of the leading countries, while explaining the reasons of his attention to the renewal of the prototypes:

"During the last decades many countries, from Belgium and Holland and to Germany and Turkey, changed their former systems of measures... the renewal of the prototypes, fulfilled on the basis of the metric units, happened in all of them. All this shows that the renewal of the prototypes of the measures of length and weight happened everywhere during the last decades according to a certain reason. The main reasons of commonness of such a phenomenon consist of the fact:

1) that before the last decades there were no methods and data, which are used nowadays for giving to the prototypes the characteristics, presenting most of the guarantees both of safety and invariability of the prototypes and of the possibility of their exact renewal in case of their damage or destruction, and

2) that during the last decades the degree of accuracy, with the help of which it is possible to make the exact copies and any comparisons of the weights and long measures, has grown noticeably, and that is why the

exactingness, required in the determination of the prototypes and their copies, used for adjusting the commerce measures and weights, has grown.

Nowadays, while determining the prototypes, the main measures are compared with the copies and these samples are kept without any application, and only those copies, which are compared again with the main prototypes after many years, which hadn't been done before and had always given cause for supposing the certain changes in the prototypes, are used for the comparison. That was the previous state of the main (archival) French prototypes of meter and kilogram, and the same is the current state of Russian prototypes. However, while determining the main kilogram and meter (1798), the copies identical with them, which are kept till today, had already been done; but while determining the Russian platinum prototype of the pound, only one copy was made (if the platinum copies of the pound had been made, they aren't known to anyone today and hadn't been found anywhere), which had been used for weighing as the French archival kilogram. This very circumstance already points enough at the necessity of renewing the Russian prototypes of weight and length."

Mendeleyev thought that measures of weight and length were the basis of the whole metrological system. All the other ones, including the measures of capacity of granular materials and liquids, time, electric and magnetic measures seemed to him to be only derived, somehow connected with the main ones. Today such point of view may look retrograde, but it is quite natural for the scientist of the 19th century. All the efforts of the House, managed by him, were directed to the renewal of namely the main measures. Mendeleyev thought that it was necessary to renew the samples of measures of length and mass, legalized in Russia, in order to give the degree of invariability to the units of Russian measures.

Works on the renewal of the Russian prototypes of length and mass were fulfilled very thoroughly, even with more accuracy than abroad, by D.I. Mendeleyev and his closest colleagues F.I. Blumbach, F.L. Zavadsky, A.I. Dobrohotov, V.D. Sapozhnikov; and they can be an example of metrological scientific research of the highest degree up to this very day.

According to the requirement of the current law, a pound was to be the main unit of weight. It was necessary to choose the already existing one in the capacity of the new sample of the Russian pound. Mendeleyev thought that it should have been the platinum sample, which had been carried out at the Depositary of Measures and Weights. Also there was the authentic platinum-iridium kilogram, adjusted by the International Commission of

Measures and Weights, and the adjusted English pound. It was significantly easing the task.

The system of the Russian units of length in the 19th century stayed being mainly the same as it had been in the 18th (1 sazhen[1] = 3 arsheen[2] = 7 feet = 48 vershok[3] = 84 inches = 840 lines). The decree of November, 7th of 1835 was ratifying in addition the meaning of sazhen. It was admitted to be equal to 7 English feet. The unite obligatory samples (standards) of this main measure of length, established by the commission of 1827, were accepted by the same decree.

After having estimated the merits and demerits of the Russian sample sazhen, Mendeleyev persuaded the director of the Department and Commerce and Manufactures V.I. Kovalevsky to decline the "old" Russian sazhen in favour of arsheen. And the English sample yard (36 inches) was assumed as a basis of producing the new prototype. Mendeleyev understood perfectly that the work package of renewing the prototypes of the main measures, planned by him, would have needed enormous expenses, which would have increased doubly in future in case of inevitable conversion of Russia to the metrical system. That is why he provided for the necessity of comparing the new Russian foot and arsheen with the kilogram and meter.

"If the comparison of the Russian measures with the English ones is an inevitable necessity because of the equality of sazhen (3 arsheen) and 7 English feet, the comparison with the metrical measures is not less necessary because of the broad expansion and facilities of the metrical methods of measuring..."

The first stage of the works on the renewal of the standards of the measures of length and weight was adjusted with the Ministry of Finance. The choice of the optimal material for the prototypes, which would meet the requirements of durability, inflexibility and endurance down to the limit, was at hand. Mendeleyev worked thoroughly over this question and sent his decisions in the letter to Kovalevsky. He suggested to use the alloy of iridium and platinum in the capacity of the material for producing the prototypes of arsheen and pound, and to make the order at London company "Johnson – Muttey", "which is noted for its platinum wares and for having provided the International Paris Commission with the platinum-iridium

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[1] sazhen – Russian measure of length. Equals to 2 m 13 cm (*Notes of interpreter*).

[2] arsheen = 0.711 m = 2 ft 4 in.

[3] vershok = 4.45 cm = 1.75 in.

meters and kilograms." It was decided to make 4 samples of long measures and 4 samples of weight measures.

After having adjusted the stages of the works over the renewal of the standards and having determined the material and shape, Mendeleyev started the immediate reorganization of the laboratory basis of the House. It was necessary not only to solve the problem of renewing the prototypes, but also the problem of preparing the qualified metrologists, verification officers, laboratory assistants, mechanics and metal-workers. During the first years of Dmitry Ivanovich's work the staff of the House was expanded significantly. Little by little the laboratories of time, electrical, manometric, water-measuring and photometrical ones joined the laboratories of measures of length, mass and temperature changes. The availability of just purchased first-rate equipment there let make works with a far more, than before, accuracy. The results of all the research, made at the Main House of Measures and Weights, were published in the first Russian scientific metrological magazine "Annals of the Main House of Measures and Weights", established by Mendeleyev. Mendeleyev wrote while recollecting the years of 1894–1895: "Publishing of "Annals"... was taking the rest of my time from the work at the House and at the Ministry of Finance."

The government, as usual, in spite of the approval of all the projects of Dmitry Ivanovich by the Minister for Finance, didn't have money.

But Mendeleyev knew how to solve such financial problems. O. Ozarovskaya, one of his colleagues at the Main House of Measures and Weights, remembered:

"The plans of Dmitry Ivanovich were increasing and expanding. He wanted to build and equip the technical workshops, chemical and water-measuring laboratories, astronomic workshops, astronomic laboratory, the pipe for mixing of the long and heavy pendulum, etc.

It was possible then to get big assignments after the approval of the State Council, the chairman of which was the heir and Grand Prince Mikhail Aleksandrovich. Dmitry Ivanovich planned the visit of the House by the grand prince for the "highest review" and for persuading him, how tight it was for the House with its varied tasks in its building. And Dmitry Ivanovich decided to stage the cram. During two days different heavy antiquities – remains of unrealized grandiose and clumsy constructions for the experiments of the previous keepers – were taken out from the basements.

Dmitry Ivanovich was heard roaring and groaning: "Not to the corner, but on the way! The heavy-hammer, heavy-hammer to the corridor!

Underfoot, underfoot! So that it would be necessary to overstep! Otherwise they won't understand that it is overcrowded. It is necessary to stumble, then they will understand!"

The roomy corridors became unrecognizable. The scientific trash was everywhere and it still seemed to Dmitry Ivanovich not enough: "It is necessary to explain!"

Finally, the day of the august visit came.

Dmitry Ivanovich, remembering etiquette, followed the heir with his suite and reprimanded imperiously:

– Not there! To the left! Don't stumble: it is crowded here... To the right!

When they reached the liquid air, which was got for the first time in Russia exactly in the House, the heir wanted to know about the quantity of the liquid air from the one, presented at that room.

– It is possible to calculate it now: ten times ten... e-eh...five... eh...eh...

– Hundred! – prompted the guest.

Dmitry Ivanovich shook his head angrily and continued emphatically:

– Ten times ten...

– Hundred! – again the chairman of the State Council didn't control himself.

– Ten times ten... – shouted Dmitry Ivanovich at the top of his voice, shaking his head, and suddenly concluded calmly: – Three hundred and fifty kilogram!

During the further detour Dmitry Ivanovich forgot about etiquette, walked ahead, half-turning backwards and noticing in an imperious tone, and the heir, while remaining behind at the turns, reprimanded in a low voice to his suite: "Not there! to the left!" – trying to imitate Mendeleyev. It was evident, that the visit to the House gave him a great and rare pleasure because of the eccentric scientist, and the problem of the assignment of the necessary funds was solved brilliantly."

By April of 1894 the prototypes, ordered at the "Johnson-Muttey" company, were ready "in a rough form." Mendeleyev was detached by the highest pleasure to accept the work and to sign the agreements with the masters concerning the final manufacturing of the prototypes. It was discovered, that the scientist and master from London Mr. Simms would have been able to cope with it best of all. His "Trowton & Simms" company was noted fairly for manufacturing the points at the linear measures, dials and verniers for the astronomic instruments for more than a century. In spring of 1895 Simms started graduating.

D.I. Mendeleyev, the director of English bureau of measures and weights
G. Cheney, the official of the Main House of Measures and Weights
F.I. Blumbach at the Eifel tower.
1895

The final technological works were fulfilled at the Main House of Measures and Weights in Russia. The copies of international prototypes of meter (N 28) and kilogram (N 12), which had been received from the International Bureau of Measures and Weights, were used for the verification of the new prototypes at the House. At the same time, together with the renewal of the prototypes, the works over the thorough determination of the main physical constants (the weight of a litre of air and water) and over the improval of the methods of precise weighings were being made.

As a result of the works over the reconstruction of the standards of the measures of length, the three samples of one arsheen long and one of semisazhen long were produced. Also the yard and the meter were graduated on the last one in addition to arsheen.

It took about two years of intensive work of the masters of the highest rank in order to write a short phrase in the report, starting with the words: "The three samples were produced..." The detailed report, made by Mendeleyev, was scarcely read by the officials of the Ministry of Finance, but it informed us vividly with the details of fulfilling the work, in comparison with which the jewellery cut of a diamond may seem to be a nursery game.

The renewal of the prototypes and the revision of the laws about the measures and weights were accomplished with an unusual speed: during the period of 1893–1899. While the similar work had been made in England for 21 year (1834–1855), and for 17 years in France (1872–1889). Besides, the work was fulfilled with accuracy, which is reached nowadays only in the best metrological institutions of the world.

The standard pound and arsheen were kept at the Main House of Measures and Weights and were used for the comparison only in the extraordinary cases, under the personal supervision of the manager of the House. The two main copies of the pound and arsheen, made of the platinum-iridium alloy at the same time with the prototypes and compared with the last ones with the maximal thoroughness, have: the first ones – the signs of the crown of 1894, and the last ones – the state emblem of 1894. The copies with the sign of the crown are kept immured in the iron box in the wall of a building of the Governing Senate in Saint-Petersburg; the copies with the sign of the state emblem were kept at the Main House of Measures and Weights and were used for the further verifications. The special main copies of the pound and arsheen (the nickel ones) with the sign of the emblem of Moscow province, compared with the prototypes, are kept in the iron box under the glass with the seals of the Main House of Measures and Weights at the Armory Museum in Moscow.

Along with organizing the works over the manufacturing the standards of pound and arsheen, equipping the House by the new equipment, instruments, selecting and preparing the staff, D.I. Mendeleyev was occupied with the establishment of the verifying institutions of a new type, which would have been under the jurisdiction of the Main House.

He prepared a group of inspectors and developed his own order of unexpected revisions at the verifying institutions and also at post offices, factories, customs, artisan workshops and in different commercial houses. The verification showed that the check of measures and weights in 15 provinces hadn't been done at all and it had been done at an extremely low level in 56 provinces. There weren't enough sample measures, and those, which had been used, were broken, usual commercial weights were often used instead of them. The balancing of scales with sand and stones was practiced everywhere.

Verification and marking were often of a casual nature. For instance, metalworkers, carpenters, woodworkers and even blacksmiths were to pass the verification in the countryside. The lack of the correct organization of control and the low level of technical requirements in the institutions, producing measures and measuring devices, caused special anxiety at the Main House. As a result, the devices, "while staying being goods, almost stopped being measuring instruments."

All this became the basis for the establishment of the State Commission attached to the Department of Commerce and Manufacturing in 1897. The commission admitted that "the municipal public governments appeared to be unable to fulfill their task successfully. The revealed defects may not be removed by the partial corrections." A proposal of D.I. Mendeleyev was accepted unanimously: to organize the system of houses of samples and weights for verificating and marking of commercial measures and weights, establishing them independently or making them attached to certain state or public institutions. First in the capacity of experiment it was decided to open 10 houses of samples and measures in big commercial cities and also in the places of manufacturing of measuring devices. It was clear that those houses were able to serve only to the limited part of the territory, and that is why the verification was kept in the town councils of the main area of Russia.

In 1899 the reform of D.I. Mendeleyev was legalized legislatively. On June, 4th the Regulations of measures and weights was royally approved by the tsar.

The first chapter of the Regulations – "About the system of Russian measures and weights" – described the standards of mass and length (pound and arsheen) rendered under the direction of Mendeleyev, it ratified the rules of their keeping and use, it initiated the new main unit of time – 24 hours. The Regulations took into consideration also the standard volume measures of liquids and granular materials with their subdivision to other measures, used in practice (squares, dessiatinas[1], and cubes). According to the item 11, it was permitted for the first time in Russia to use "electively" the international metrical measures – meter and kilogram – together with the main Russian ones.

The second chapter – "About the institutions for the verification of measures and weights" – was determining the functions of the Main House and was making it responsible for the provision with the unity of measures and weights in the country, for the expansion of the sphere of influence to the local verifying institutions. Henceforth the functions of the Main House included the testing and verificating of the special measuring devices, used in commerce and industry.

The last chapter of the Regulations – "About the supervision over the use of the traders' measures and weights" – clearly defined the rights and obligations of the state institutions, which were to supervise over the used measures and measuring instruments, for the first time in Russian practice. Now the Main House detached its inspectors to the houses of samples and measures once in three years for the joint realization of unexpected revisions of the state institutions, post offices, railway stations, factories, commercial and industrial institutions. The results of the revisions, as it was mentioned in the Regulations, were to be published as reports in the editions of the Main House.

It was provided in the Regulations to improve the laboratory and industrial basis of the houses of samples and measures, to expand the nomenclature of measuring means, used by them, to establish close links with the Main House, with the industrial organizations in provinces. Thus, the Regulations laid the foundation of the unite state system of the verifying services.

On September, 11th of 1899 D.I. Mendeleyev got a notification from the Department of Commerce and Manufacturing, where the opinion of the State Council was expressed.

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[1] dessiatina = approx. 2 3/4 acres (*Notes of interpreter*).

Sir Dmitry Ivanovich!

The Ministry of Finance and the House, committed to you, is entrusted with a whole series of tasks, the accomplishment of which will need many spade-works, by the opinion of the State Council, royally approved on June, 4th of this year, and by the Regulations about measures and weights. They are:

1. According to the Second part of the opinion of the State Council: to determine the areas, where the five houses of samples and measures should be opened in 1900, and the area of their activity, and also to establish the necessary relations with the institutions, where opening is supposed.

2. According to the Fourth part: to enter into the consideration of a question of gradual reserve of measures and weights, which are not meeting the requirements of the articles 27–36 of the Regulations about measures and weights, from commerce and industry.

3. According to the Sixth part: a) to determine special measuring instruments, the use of which in commerce and industry is allowed only in case of the appropriate check and graduation at the verifying institutions; b) to determine the proportions of the taxes for the regulation and marking of: unequal-arm, wag, decimal-balance and other weights and measures, of weights and measuring instruments, presented by the state and private institutions to the Main House, and equally special measuring instruments at the houses of samples and measures (if they will take place); c) to determine with the special instructions the rules of the method of selling the grains, of using of dry measure, etc. in the commercial deals, of the form of the legal weights of the skin and other parts' firmness, upon which the weight is being guided by the order of book-keeping and of the accounts of the Main House and the local houses of samples and measures.

4. According to the Tenth part: to be preoccupied to production of special main copies of the standard pound and arsheen (the prototypes) for giving them to the Armoury Museum in Moscow.

5. According to the 12th item of the Regulations about measures and weights: to publish special tables, determining the ratio of metrical measures to the Russian measures.

6. According to the 16th item of the Regulations: to produce: the samples of measures of granular materials, the precise copies of measures, used by the local verifying institutions for checking the commercial measures and weights; to determine the rules of testing and regulating the special measuring instruments of any kind; to look into the compilation of

comparative tables of Russian, metrical and also other foreign measures; to determine the greatest measure of inaccuracy, allowed in the sample measures, used for the current checking in the verifying institutions: to make instructions, determining the order of verifying of measures and weights in the local verifying institutions, and also the programs of testing the verification officers.

7. According to the 25th item of the Regulations: to point out the annual reporting forms of houses of samples and measures (or at least determine the main requirements to them).

8. According to the 27th item of the Regulations: to lay down the rules of regulating and marking the scales with the upper pans and with the double scale-beam, etc.

9. According to the 33rd item of the Regulations: to lay down the rules of regulating and marking barrels, vessels, etc.

10. To determine the tariff of fares for the verification officers according to items 37 and 40 of the Regulations.

Many of the mentioned works are completely referred to the duties of the Main House; some of them may be fulfilled only through joint work of the House and the Department of Commerce and Manufacturing. On this account I have the honour of asking Your Excellency to be so kind to inform me of your ideas concerning the accomplishment of the stated requirements of the law.

I ask Your Excellency to accept the protestation of absolute respect and devotion.

Signed: V. Kovalevsky.

V.I. Kovalevsky – the director of the Department of Commerce and Manufacturing and the friend of the Minister for Finance, the associate of D.I. Mendeleyev, who took an active part in the scientist's work at his post of the manager of the Main House. He took part in the preparation of the law "The Regulations about measures and weights", he made a significant contribution to its realization, particularly in the establishment of the houses of samples and measures.

The spade-works for the accomplishment of the set of problems started at the Main House of Measures and Weights. In order to provide the unity of measures in the country, it was necessary to organize the production of standard and working measuring instruments both at the workshops of the Main House and at the factories of the country. Their activity was managed

by Mendeleyev himself through the Ministry of Finance. The scientist ordered the part of equipment and measuring devices at the best foreign companies ("Ertling", "Trowton & Simms", "Siemens & Halske", "Riefler", "Rupreht"), with which he had been keeping in touch for many years.

According to the first item of the document mentioned above, the areas of the first houses of samples and measures were determined. It was decided to open four of them in the capital centers: Saint-Petersburg (houses N 1 and 2), Moscow (N 3) and Warsaw (N 5). House N 4 was established in the village of Pavlovo of Gorbatovsky district of Nizhegorodskaya province, which had had ancient traditions. The village was the centre of famous homecrafts, "the bench capital of Russia." Week by week the inhabitants from almost two hundred settlements used to come here on Monday in order to sell at the cornering some varied metal goods: locks, knives, scissors. Now, after having been marked at the house, artisans could also sell scale-beams.

During two years after having opened the first houses of samples and measures, a thorough analysis of their activity had to take place. "The further arrangement and allocation of the local verifying institutions in the empire" depended on it.

Soon the system of scientific-metrological institutions, created by D. I. Mendeleyev, had occupied one of the leading places in Europe. The Main House of Measures and Weights fulfilled its administrative functions brilliantly and was splendidly equipped for making research. The houses of samples and measures also justified themselves. Already in 1895, thanks to his active work in the sphere of metrology, Dmitry Ivanovich Mendeleyev was elected to the members of the constant International Committee of Measures and Weights.

By this time the authority of Mendeleyev in Russia was undoubted both in the science circles and the power structures.

O.E. Ozarovskaya, a member of the Main House of Measures and Weights, remembered: "According to the traditions of that time, remains of some estimated assignments were distributed among the workers as a bonus for Christmas or Easter. In all the institutions there was a principle of distribution according to the salary: the more is salary, the more is bonus. The manager himself and his assistant at the House were absolutely excluded from the bonus, and if the rest were receiving less funds than their monthly salary, anyway the lower workers could have got sometimes a bonus bigger than their monthly salary.

In 1900 the remains were rather big; Dmitry Ivanovich planned to detach the workers to Paris to the exhibition instead of giving them the bonuses, having timed the trips to the time of their vacation in two turns.

When the minister was given the list of 16 people and among them were a metalworker and a carpenter, he became angry with such unprecedented numbers and staff of the trips and endorsed a severe application. Dmitry Ivanovich went to the deputy minister V. I. Kovalevsky and forwarded him his petition for the retirement. The last one supplicated Dmitry Ivanovich to wait and promised him to delay the endorsed application... After having waited for more than a minute, Kovalevsky asked Witte anxiously:

– Sergey Julyevich! If the lady, whom you love, tells you: "Buy me 16 arsheen of ribbon, otherwise I jump out the window," – what will you do?

– Certainly, I would buy it, – smiled Witte.

– So, this lady, whom both of us love very much, is Dmitry Ivanovich Mendeleyev and he sends in his resignations if we won't send to Paris 16 of his workers, and the metalworker and the carpenter among them. He doesn't yield to anything, his petition for the retirement is in my pocket and here is his application with your decision.

S. J. Witte smiled, crossed out "refuse" and wrote: "fulfill." It was a big secret for us, till one day a clerk told us: "Those, who want to go to the exhibition to Paris, should enroll in the turn for June and July. Everyone will get the money at the rate of two hundred rubles before the departure."

We were stunned and became stupefied because of happiness. Two of those who had families preferred to use the unexpectedly big sum in order to fill up the household gaps, but not the metalworker and the carpenter, who had been burdened by their families; they went and it seemed that they obtained most of all from the exhibition in Paris.

After having just returned from Paris, we learned, that we risked to stay without Dmitry Ivanovich because of our happy trip."

The last years of life

In spite of the dimensions and variety of activities at the House, during the 1890's the scientist kept watching the development of the main directions of inorganic and physical chemistry, having expressed his attitude towards the discoveries and research of the last years in the number of works, and first of all in the 6th edition of "The Fundamentals of Chemistry." The previous, 5th edition of "The Fundamentals of Chemistry"

both in Russia and abroad had been sold very quickly, and instead of the first planned additions to this editions, Mendeleyev started working over the new one – the sixth. It was published in May of 1895 and was translated into French and English. It was said in the foreword to the French edition, written by A. Gotie, that "the book comes from the master, who... has lighted up the contemporary science", that it was worth reading it and thinking over by the representatives of the young generation of French chemists. While enumerating the plenty of subjects, mentioned in "The Fundamentals of Chemistry", Gotie particularly emphasizes the form of presenting the material, used by authour, – the additions to the main text, mentioned "in an exclusively clear form, which is shaped by Mendeleyev to his works, with a deep erudition and originality, which make up the charm of these notes."

It was already mentioned about the activity of D.I. Mendeleyev in the sphere of oil and coal industry. The Ural expedition of 1899 and the research of Ural iron industry became "the third affair" in the sphere of industry and economy, in the fortune of which Mendeleyev was able to "take part." Mendeleyev thought that the preservation of semiserfdom relationships was the main reason of the depression of Ural's industry: "...it is inevitable, it is necessary to finish all the remains of landowner relation, which is still existing everywhere in Ural in the form of peasants, attached to the factories, with a special persistency." Also the scientist noted that "the local mountain authorities", i. e. the local bureaucratic staff, was suppressing all the initiatives, was prohibiting from the establishment of the new small concerns. Mendeleyev had always held the opinion that "the true development of industry is impossible without free competition of small and average manufacturers with big ones."

In order to quicken the development it was necessary to provide Ural with contemporary qualified staff. Mendeleyev insisted on the necessity of opening in Ural "a special higher polytechnic with a special development of metallurgical sciences there."

The works of D. I. Mendeleyev during the 1890's in the sphere of economy are in aggregate with the harmonious system of the economical viewpoints of the scientist. The belief of Mendeleyev that the industrial way of development was historically inevitable for Russia was the basis of it, however, the young national industry needed protection of the customs policy of the state. According to the opinion of the scientist, the customs-tariff of 1891, in the working out of which he had taken part, "already started

protecting the growth of extractive and manufacturing industry, though in very moderate dimensions."

The economical works of Mendeleyev became popular abroad. He had been invited as an expert to solve many industrial and economic questions.

The year of 1899 was particularly noted for Dmitry Ivanovich Mendeleyev with an especially important event.

Half a century passed since the days, when young Dmitry Mendeleyev with his mother and sister were leaving their native town. And on June, 30th of 1899 the one-funneled steamer "Fortune", overcoming the cross-wind with a drizzly rain, reached the berth of Tobolsk. The 65-year-old actual counselor of state, academician of tens of academies, professor of the world's leading universities Dmitry Ivanovich Mendeleyev was standing on a wet deck, having covered himself with a wide anther. The mayor came to meet him at the pier, the head of the police read out the greeting from the governor.

Tobolsk almost hadn't changed during the last half a century after having left aside of the railways. The same houses, churches, trade rows, wooden pavements. There was an overgrown waste ground with grazing cows at the place of his native house. Nearby there were rickety houses, where the exiled Decembrists lived.

In two days Mendeleyev visited the settlement of his childhood – Aremzyanka. The house, where the Mendeleyevs lived, was taken to pieces because of being too old, the factory had burned long ago, but the church, built by his mother, was still there. The visit of a well-known compatriot wasn't a secret for the inhabitants. Those, who remembered restless, obstinate Mitya, were among the people who were meeting him now. Dmitry Ivanovich made a photo with the people of his age before leaving. On July, 6th D.I. Mendeleyev, the noble citizen of Tobolsk, was bidding farewell to the places of his childhood, while standing on the deck of the steamer "Tobolsk" and understanding perfectly that he would never come back there.

During the last years of his life D.I. Mendeleyev worked with the same enthusiasm and energy. Since 1903 the new period started in the activity of the Main House, when the organizational work over the establishment of the system of houses of samples and measures on the territory of the whole country and the organization of control of the verification work and supervision over the correctness of measures and weights started playing a more important role. Mendeleyev was constantly counseling the workers of the 1st house; he was trying to get the additional funds for purchasing of

new devices. He attracted the workers of the house to the research, made at the Main House of Measures and Weights, in order to raise the level of their skills and to help them financially.

In 1904 Dmitry Ivanovich was at the reception of E. Pleske, the just appointed Minister for Finance. Mendeleyev shared his ideas of developing the verifying work in Russia, of preparing specialists for working in the houses, of organizing the supervision with the new minister.

Pleske remembered properly the report of Mendeleyev, received by him in October of 1903 – when he was a manager of the Ministry. In his report the scientist noted the whole series of neglects in the regulations about the houses, he paid his attention to the lack of the appropriate supervision over the condition of measures, weights and the level of preparing the local verification officers.

Pleske listened to Mendeleyev attentively and was amazed by the readiness of a 70-year-old scientist to prepare the necessary materials in three days and to give a report to Pleske.

When Mendeleyev came back to the House and told in a joyful excitement that he had promised to the minister to write and print the report in three days, the whole House started moving. The most experienced worker of the Main House A.N. Dobrohotov, the manager of the House D.B. Shostakovich, the verification officer I.I. Popov were called for the study and got the task to prepare some draft materials for the report in a day. Dobrohotov started writing the proposals for the organization of training the specialists, Popov and Shostakovich were to write about the improvement of the local verifying work. Mendeleyev himself was to state his ideas of the scientific elaborations of the Main House during the last years and to prepare some draft materials about the system of organisation of the supervision under the aegis of the Main House.

In three days the report was lying on the table of Pleske and became the basis of accepting by the government the fundamental decisions concerning the perfection of the verifying work in Russia.

In 1904 the 70th anniversary of the great scientist was celebrated by the world-wide community. Mendeleyev got thousands of congratulations, including ones from the most famous scientists, scientific and technical societies, academies and universities. Russian and foreign newspapers and magazines were publishing conversations and interviews with him concerning the issues of the day ("What is spoken about the death penalty", "The tariff war", "D.I. Mendeleyev about the war"). While communicating with journalists, the scientist was always paying his attention to his program of the development of industry and education in Russia: "...in order to make

the country wealthy, powerful and mighty, that it wouldn't be afraid of enemies, that people in his country wouldn't vegetate as animals, – in order to do all this it is necessary for industry and commerce in this country to prosper", and "the proper educational institutions with a strictly worked out contemporary program were necessary" for the industrial break.

Numerous directions of the scientist's activity in the sphere of education were summarized in his last big works: "The notes about the public education in Russia" (1901), "Intimate thoughts" (1903–1905), "The project of the school of tutors" (1905–1906). The work "To the knowledge of Russia" (1906) is also among the final works of the scientist.

This book, and also the "Intimate thoughts", can be regarded as the spiritual will of Dmitry Ivanovich Mendeleyev to the future generations. The range of issues, analyzed by the scientist in the "Intimate thoughts", is extraordinary broad. These are education, correlation of enlightenment and national wealth, of industry and agriculture, the issues of demography and criticism of Malthusianism, the foreign commerce and arguments for the protectionism, peculiarities of the geographical position of Russia and taking them into account while predicting its economical development, the sources of capitals for development of Russian industry and, finally, the issues of the state structure. He considered the development of enlightenment and industry to be the main tasks of Russia.

The scientist planned to finish the book "Intimate thoughts" with a chapter about his world view.

He wrote in the conclusion, dated by October, 4th of 1905, "To finish the book I wrote a short chapter about the world view, certainly about my own one, which gives me an opportunity to stay being *gradualler* for all my tendency to admit the inevitable dominance of the rational labour above all and its triumph in the most varied applications to the general external use and to the internal good, which is also general and private only partly. I wrote it but I don't publish it because the statement seemed to me incomplete, requiring many determinations, and sometimes it starts criticizing and partly revealing the things, which are better to be left inside. And I want to express the most intimate idea of the inseparability and compatibility of such separate sides of knowledge as: substance, strength and spirit; instinct, mind and will; freedom, labour and duty.

The last one should be admitted concerning family, homeland and mankind, and the supreme realization of it is expressed in religion, art and science. Throw away one element from each trio, and it will be only the analysis without complete synthesis, it will be a changeable and sugary

unsteadiness, and despair or nonsense, which doesn't hold the first water, is much likely to get into the vacuum. Perhaps someday I will try to rewrite it, but not only today."

The last big work of the scientist "To the knowledge of Russia" refers to 1906. While seeing that the country was on the brink of big changes, he addressed again to the analysis of economic state of Russia. The issues of the populations take an important place in this work.

D.I. Mendeleyev kept working actively. The experiments with the big pendulum on the determination of gravity acceleration were started at the Main House of Measures and Weights according to his program. The English-Russian literature society proposed to translate his works into English – the 8th edition of "The Fundamentals of Chemistry" and "To the knowledge of Russia." He was working up and summarizing the enormous statistic material on economy and population all over the world.

The interest and high respect of the foreign scientists to the personality and works of D.I. Mendeleyev is confirmed by one more fact. Dmitry Ivanovich Mendeleyev had been nominated three times for the Nobel Prize: in 1905, 1906 and in 1907. All three times he was nominated by the foreign scientists. But every time the different circumstances prohibited him from getting the prize.

In 1905 the candidature of Mendeleyev appeared in the "short list" together with A. Bayer (Germany) and A. Moissane (France). Professor from Munich Adolph Bayer got the status of the laureate because he had been nominated every five years before. The analyst of the work of the Nobel Fund Abram Bloch wrote: "it was just the turn of Bayer, formed secretly at the committee, and besides, Mendeleyev was secretly suggested to wait for the next year."

In 1906 the candidature of Mendeleyev was nominated by more scientists. The chairman of the Nobel Committee Petersohn thought that Mendeleyev was "the first to be taken into consideration during the discussion concerning the prize of this year", because the discovery of the Russian scientist was considered by him "the deepest and the most fruitful scientific idea." However, the members of the Nobel Committee had objections in connection with the novelty of the discovery – D.I. Mendeleyev had published his work almost 30 years ago. As a result, A. Moissane won the Nobel Prize of 1906. A. Bloch thought that "the fear of making a precedent by awarding the old discoveries" played an important role in the final solution of this question.

In 1907 the opportunity of sharing the prize in chemistry between Mendeleyev and the Italian scientist Cannizzaro was discussed. However, Dmitry Ivanovich died on February, 2nd.

During the last years of his life D.I. Mendeleyev, who had sincerely liked traveling, was especially longing to go to Switzerland and Italy, which were connected for him with the wonderful memories of his youth. When Mendeleyev went abroad for the last time, he told half in jest to his son, while saying goodbye to him at the railway station, the Italian proverb: "To see Naples and to die." He had been to Naples during that trip. And he died in winter of the same year.

On January, 11th of 1907 D.I. Mendeleyev was showing the Main House of Measures and Weights to the Minister of Commerce and Manufacturing D.A. Philosophov. Dmitry Ivanovich had to wait for his guest for a long time at the porch outside. The weather was frosty and windy and as a result Mendeleyev caught cold. The doctor found out that it was dry pleurisy. Dmitry Ivanovich felt bad, however, he kept working. The sister of Dmitry Ivanovich Marya Ivanovna Popova came to visit her ill brother and later she told about that visit like that:

"I came to him...he was sitting pale and frightful in his study. He had a pen in his hand.

– So, Mitenka, are you ill? You'd better go to bed...

– All right, all right... Smoke, Mashenka...

– I'm afraid of smoking at yours, it is harmful for you.

– So I will smoke too...

And he began to smoke. And the pen was still in his hand."

The last words were written by him in an unfinished manuscript "To the knowledge of Russia": "As a conclusion I think that it is necessary to say, though in general outline..."

In a few days professor Yanovsky found out that Dmitry Ivanovich had pneumonia.

On Friday, January, 19th (according to the Old Style), on the last day of his life Dmitry Ivanovich was in unconsciousness all the time, he was hardly breathing. However, while recovering consciousness but, nevertheless, suffering greatly, he asked to be read aloud. That day he was read "The travel to the North Pole" by Jules Verne. The reader stopped reading when he was losing consciousness. However, Dmitry Ivanovich said after having recovered his senses:

– Why aren't you reading, I'm listening.

He felt badly, however, he didn't say goodbye to anyone, he didn't talk about death with anyone. Though he wasn't actually afraid of its coming and was speaking and writing often about the term of life for the last years, was making the last instructions for his wife and children. Perhaps he didn't know that he was dying and perhaps he just didn't want his passionately loved family to worry in advance.

Dmitry Ivanovich died on January, 20th.

His niece N.Y. Kapustina-Gubkina wrote: "He died from the heart failure. First he was hardly breathing, then sparsely and more quietly, and he died at 5 o'clock in the morning... To the moment of my arrival Dmitry Ivanovich was already lying majestic and calm on the table in the room with the arms put crosswise together, and his motionless handsome face seemed to say: «Now I have learned what is invisible for you, still living...»"

The eyes of Dmitry Ivanovich Mendeleyev were shiny and blue till the very last days of his life, and, according to the recollections of his contemporaries, sometimes they were looking for the last years "so clearly and kindly, as the eyes of a man not of this world."

Nevertheless, what kind of a person was Dmitry Ivanovich Mendeleyev? We know the portraits of the scientist by Yaroshenko and Vrubel. Of course, it is difficult to judge now the precision of their showing of his appearance and character. But Ivan, the son of D. I. Mendeleyev in the second marriage, thought that there were almost no "portraits, which expressed complete and vivid impression of his personality." And he connected it with the "unusual sensitiveness, mental liveliness and versatility of the personality" of his father.

The contemporaries of Mendeleyev, who had known him closely and not, always noted in their memoirs his heightened "nervous irritability" and a kind of "impatience." It was expressed on the surface with a rich, indicative mimicry, in "the roars of his baritonal voice", in his "bass exclamations", which were changed by "the screaming high notes." He had a trot; the movements of his body were fast and nervous. During the conversation he was always gesticulating. He used to seize his head, when he was suddenly upset or distressed. He used to cover his eyes while thinking.

Kapustina-Gubkina remembered: "The very expression of his face and eyes changed according to his words. He used to wince, bow, groan and peep while speaking about the things, which he didn't like, for example, about the words: clergymen, vulgar Latin and tendency. But when he was talking, for example, about God as of the highest element, of the movement,

his voice was clear and low, the head rose, the eyes were sparkling." According to the words of his son, Dmitry Ivanovich "couldn't flatly help showing his emotions in private life." "He was all on hand, all outside with his joys and sorrows..."

Those, who didn't know much about Dmitry Ivanovich and judged him skin-deep, considered his character to be unbearably hard: he was easily irritable and screamed, he always treated his work extremely rigorously and required the same from the others. And he always warmly attached himself to all of his colleagues, laboratory assistants, servants and had never refused to help them.

Dmitry Ivanovich didn't like to hear somebody talking about anyone badly: he always interrupted such conversations. He also didn't like to be thanked; he always avoided those expressions of thanks or shouted at the person who thanked him: "Stop it... It's all nonsense... And nothing to thank for. Nonsense, nonsense!.."

At home Dmitry Ivanovich used to wear a wide cloth coat without a belt. He rarely wore a uniform or a dress coat. He didn't emphasize clothes and so-called decencies and conventionalities. Once Dmitry Ivanovich was to be introduced to Alexander III. The Tsar was very interested whether Mendeleyev would have cut his long hair on such an important occasion. But even at this time Dmitry Ivanovich didn't betray his habit to cut his hair only once a year, in spring, "before the warm."

The order of day of the scientist depended on his work. He could work all night long and then he got up lately; if he went to bed early, he would also get up early. He liked to work at night, when it was quiet, when the children were already sleeping and nothing could disturb him.

The order of his day was approximately like that. He got up, washed and drank tea. After having greeted the family, he worked till five o'clock or half past five. He could go for a walk in the case of good weather, but always having a certain goal: to buy something for the children – sweets or fruit. He had dinner at 6 o'clock, he ate not much. He liked having someone of his friends or relatives at dinner.

He liked to read after dinner. After having rest, he started working again and worked till late at night.

Dmitry Ivanovich rarely left his home, only on business. He practically never went on visits. He visited only the annual dinners of the Wanderers and of the University on February, 8th. He used to go to the theatre rarely. He thought that the habit to go to the theatre many times prevented from concentrating; it habituated to look for the entertainment from the outside

and forced to fill the life with “the trifles and rubbish.” But he liked art exhibitions very much.

N.Y. Kapustina-Gubkina wrote in her memoirs: “Some people said that Dmitry Ivanovich had a difficult temper. The others told that he had an uneasy character.” The third ones called him a lion in a den, who was roaring when somebody entered. But those, who knew him closely and loved him, knew how much his soul was full of kindness and gentleness.”

The representatives of the scientific societies, universities and many other institutions of Russia, which were connected with his activities, came from different cities of Russia in order to bid farewell to D.I. Mendeleyev.

On January, 23rd Petersburg was burying D.I. Mendeleyev. Students, changing one another, were carrying the coffin all the way from the Technological Institute, where the last requiem took place, up to the Volkovo cemetery. About 10.000 people took part in the seeыing-off. The newspapers noted that Petersburg had never seen such a vivid expression of public sorrow of its great compatriot since the funerals of I.S. Turgenev and F.M. Dostoevsky.

All the Russian newspapers published obituaries, portraits and articles describing the scientific and public activities of D.I. Mendeleyev, where his great services to Russia were emphasized. By telegraph the entire world was informed of the sad news. The sympathetic telegrams were coming to Russia from many countries. Virtually every big foreign newspaper published reports of D.I. Mendeleyev’s death. Some newspapers printed the detailed information about his life and activities, stated the evaluations of his creativity, made by the starts of the world science. The scientists, public and political figures noted the invaluable contribution of D.I. Mendeleyev to the development of science.

The services of Dmitry Ivanovich Mendeleyev in different spheres of chemistry, physics and education were enormous. Besides, he studied seriously the problems of economy, he influenced practically and theoretically development of oil, iron and coal industry of Russia; he didn’t lay aside literature and art. When Dmitry Ivanovich was called genius, he used to wave his hand and say: “What a genius? I’ve been working hard for all my life and became a genius...”