1. Introduction

Born in Berlin, Hermann Trautschold (1817-1902) settled down in Moscow in 1857 and lived there till 1888. During 30 years of his work in Russia and for Russia, he became a devoted explorer of Russian nature, a geologist and palaeontologist, an educator, communicator of scientific knowledge and practitioner of science. The first detailed account of his biography was given in his obituary written by a renowned geologist A.P. Pavlov right after Trautschold’s demise [Ошибка! Источник ссылки не найден.]. Pavlov provided a thorough analysis of Trautschold’s works in the field of geology and palaeontology and pointed out to a somewhat ambivalent nature of his work that combined mostly descriptive studies with generalisations, characteristic of mature science.

In this day and age, I.A. Starodubtseva and V.V. Mitta have done a lot to popularise Trautschold’s biography on the Internet, having posted the texts on the “Cretaceous System of Russia” website (cretaceous.ru) and in the Electronic Library “Russia’s Scientific Heritage” (http://e-heritage.ru/ras/view/person/history.html?id=42080568). Pavlov wrote prophetically that, after Trautschold, no one would be able to determine Moscow’s fossils without referring to his works. Today’s geologists, palaeontologists and historians of science return to his works time and again [2–7]. Based on the personal fonds of Trautschold’s mentees, stored in different archive depositaries, as well as on the collections from the Archive of the Moscow Society of Naturalists (‘MOIP’), the authors of this paper aim to show how their tutor and mentor influenced their scientific interests and civic consciousness.

2. Trautschold’s first stay in Moscow

Trautschold first came to Russia as a domestic tutor for the elder sons of a rich landowner F.N. Luginin. He was recommended to Luginin by a young chemist, future professor at Moscow University N.E. Lyaskovskii (N. Liaskowski). In 1844, when he was working at Justus (von) Liebig’s laboratory
at the University of Giessen, Lyaskovskii met the professor’s assistant Hermann Trautschold. In 1846, Trautschold travelled the countries of Western Europe with F.N. Luginin and his older sons Vladimir and Svyatoslav. Vladimir was particularly impressed by the spectacle of ‘almost revolutionary’ Rome, stirred up by the beginning of Italian people’s struggle for national independence.

The young tutor was lively, cheerful and easy-going, and full of liberal thoughts. The children instantly took a liking to him, particularly as the father of the family was liberally-minded himself and not only sympathised with the reforms of the 1860s but also actively promoted them. Trautschold taught his pupils all subjects, including Latin, to prepare them for university. Later on Vladimir Luginin (W. Louginine as he became known internationally and will be referred to in this paper) wrote that Trautschold had a tremendous impact on the formation of his interest for both natural sciences and social issues, and cultivated in the boys the seeds of responsible social behaviour, planted by their father’s strict guidance. In 1848, when the February Revolution in France spread to many other countries of Western Europe, Trautschold left to “fight tyranny” but, later on, their paths often crossed [8].

3. Trautschold and MOIP

In 1857, Trautschold settled back in Moscow – this time for long. Being a tutor to the kids in a rich Moscow house, he instantly involved himself in Moscow’s scientific life. Until the 1860s, MOIP remained an intellectual centre, not only for Moscow but for the whole country. The Society united everyone interested in natural science, both professionals and amateurs, established researchers and aspiring beginners. The Society members discussed their works with the colleagues and availed themselves to abundant collections and a unique library, replenished with new publications through exchange with the scientific institutions and societies, both Russian and foreign. The Society spent its modest funds on publishing its members’ works and organising geological, botanical, zoological, and palaeontological trips (“excursions”) aimed to explore Russia’s nature resources. Being published in German and French, the MOIP journals (Bulletin, Mémoires) had a status of international publications and the articles contained in these journals were regarded as prestigious and helped to promote their authors’ reputation as scientists both in their own country and internationally. Many prominent researchers started out on their journey of science with an article published in the Bulletin, and Trautschold was one of them.

Soon after he arrived in Moscow without waiting for an official position (it was only in 1863 that he became a teacher of Latin at the Imperial Moscow University), Trautschold came to MOIP. He was brought there by I.B. Auerbach, a lecturer at Petrovsky (sometimes translated as Peter, Peter’s and Petrine) Academy of Agriculture and Forestry, a geologist and mineralogist. Before coming to Russia, Trautschold had been fascinated with many scientific disciplines including chemistry, and Auerbach helped him decide in favour of geology and palaeontology. To be admitted to the Society, one had to provide an evidence of one’s research abilities such as a publication or a scientific presentation, and the recommendations by prominent scientists. By the time he joined the Society in 1858, Trautschold had an article about ammonites published in the MOIP Bulletin (1857) as well as the recommendations from two MOIP Secretaries, Karl (Charles) Renard (K.I. Renar) and I.B. Auerbach [9]. All of Trautschold’s scientific career was associated with MOIP. Most of his works (about 120, with the exception of 3 volumes of his textbook of geology in Russian and a few articles) were published in the MOIP Bulletin or Mémoires in German and sometimes in French.

Even during his professorship at the Petrovsky Academy of Agriculture and Forestry (1869-1888), Trautschold continued to publish his writings in MOIP’s journals. Apart from the articles on geology and palaeontology, these included the reports on his scientific trips, the obituaries of the geologists and palaeontologists some of whom were Trautschold’s friends (Auerbach, Hans Rudolph Hermann (Iosif Rudolfovich German)), critical reviews of new geological and palaeontological literature, and various pieces of information concerning scientific events. Before the new works were published, there were discussions held at the Society’s meetings, often accompanied with the demonstration of palaeontological findings, as well as the presentations of observations and findings made during the
geological excursions. Trautschold was particularly intensively involved in MOIP’s activities when he worked as the MOIP Secretary (1872-1886). He was in charge of the organisation of the Society’s internal life and its relationships with the external world, often acting on behalf of the Russian and foreign partners. Kindly and energetic, Trautschold communicated with many people. Young researchers sought to be acquainted with him so as to discuss scientific issues with him, and Trautschold always remained available to them.

4. Trautschold’s mentees in Moscow
One of the first to make it into Trautschold’s circle of influence in the 1960s were the students of the Imperial Moscow University and bosom friends Wyrouboff and Petunnikov (Petounikoff). They were set on “beating their own path in the orchard of science,” as Wyrouboff later wrote in his letter to Petunnikov [10]. Many years after their graduation, he wrote, “Youth striving for the cognition of truth, the aspirations of soaring the endless heights – aren’t these good memories?” [11]. It was Wyrouboff’s dissatisfaction with the teaching of geology at the University (which he who had already visited Western Europe found obsolete) that brought him to MOIP. He presented a paper on the colour of fluor-spar that was soon published in MOIP Bulletin, and became a member of MOIP in 1866. The lecturers at the Petrovsky Academy I.B. Auerbach and G.A. Trautschold instilled in Wyrouboff love for their science: when expounded by Auerbach and Trautschold, geology and mineralogy appeared extremely fascinating. His senior colleagues helped Wyrouboff to settle upon mineralogy and crystallography.

In 1866, Wyrouboff left Russia for good and settled down in Paris where he published the first positivist journal, La Philosophie positive: revue (1867-1883), together with Émile Littré. This journal became well-known in Europe. Living in Paris, Wyrouboff continued his studies in the field of crystallography, mineralogy and chemistry, working in his own private laboratory till the late 1880s and maintaining the status of independent researcher. He had published many articles in the periodicals of the Chemical and Mineralogical Societies (Annales chimiques et physiques, Bulletin de la Société Francaise minéralogique) whose member he was. In 1886, he defended his dissertation for the doctor of physical sciences degree (Docteur es sciences physiques) at Sorbonne, hoping for the chair that would have a respective research laboratory. His hopes, however, had never been fulfilled and he was also forced to abandon his individual research due to very modest possibilities of a private laboratory. In 1901, he was awarded Prix La Caze (also spelled the Lacaze prize) of the Paris Académie des Sciences for the works on the chemistry of rare earth elements together with a French chemist Auguste Verneuil, a renowned specialist in applied chemistry and inventor of a commercially successful method of flame fusion used in synthetic gemstone manufacturing. In 1904-1913, Wyrouboff occupied the chair of the general History of Science at the Collège de France (the first such chair in history), where he gave an original course of lectures [for more detail, see 12].

For the rest of his life, Wyrouboff remained grateful to MOIP and his mentors, who helped him to find his place in science. He valued MOIP publications and, in the beginning, used to send the copies of his La Philosophie positive to MOIP until they began get stuck in the “censor's drawer” as Wyrouboff put it. He was always glad to meet with his compatriots in Paris, relishing the opportunity to speak in his mother tongue. In the summer of 1867, during the International Exposition, he received the “Moscow’s mineralogists” Trautschold and Auerbach, having shown them the scientific world of Paris. Wyrouboff appreciated original conclusions in Trautschold’s Masters dissertation (“On the hundred-year cycles of risings and fallings of the Earth’s crust”, 1869) [13]. In 1873, he paid tribute to the first part of Trautschold’s textbook “The fundamentals of geology” even though he believed that the author’s general considerations concerning geology were “a bit weak” [14]. After Trautschold’s demise, Wyrouboff wrote about the significance of his works for Russia although he found them to be somewhat too descriptive [15], which was more typical of the 18th century lovers of science.

Petunnikov who mostly stayed in Moscow, only leaving it for his scientific trips abroad or to tend to his duties as municipal officer, was the one who was most closely associated with Trautschold. Petunnikov first appeared at MOIP as an “external attendee” (‘storonnii prisutstvuyushchii’). In 1862,
he published his first article on the cuticle in the MOIP Bulletin and, in 1865, was admitted as MOIP member on the recommendations of his teacher of botany N.N. Kaufman and the MOIP Secretary I.B. Auerbach [16]. Initially, Petunnikov devoted much effort to the Society’s matters, having become its librarian (1867-1871).

In the 1870s, on Wyrouboff’s request, Trautschold tried to help Petunnikov to find a teaching position with a higher education institution. After this attempt failed, Petunnikov reinvented himself as a journalist, publisher, promoter and translator of foreign scientific and educational literature (collaboration with a Moscow publisher N.I. Mamontov), and elected member of the Moscow City Council he became in 1873 (1875-1882, 1886-1888, 1900-1911). Petunnikov fully committed himself to all of these matters, engaging occasionally in the botanical studies he loved so much. Eventually he became an authority on the Moscow suburban flora and his fundamental treatise on this topic [17] became a connecting link between the works of his teacher N.N. Kaufman and his disciple D.P. Syreishchikov. Actually Petunnikov helped the latter quite a lot with his book, even provided him with much of his own materials.

In 1873-1877, Petunnikov together with the zoologists S.A. Usov and L.P. Sabaneev were the editors of Priroda, a popular science journal, to which Trautschold became a contributor. This journal was distinguished for the broad scope of themes it covered and for its interest in the discussions of controversial and topical issues such as the atomic theory in chemistry and Darwinism. Thus, zoogeographer N.A. Severtsov, botanist A.N. Beketov, and zoologist N.P Wagner offered the arguments in favour of Darwin’s theory of species, based on the examples from their respective disciplines [18]. At the same time, an article by N.N. Strakhov, a religious philosopher and an opponent of Darwinism, was also published in Priroda, as the editors found the author’s arguments interesting. Trautschold took no part in the debates over Darwinism in the Priroda journal. As a matter of fact, his position on Darwin’s theory turned out to be controversial. Thus, in his earlier article [19], Trautschold provided the examples of transitional forms in paleontology as an evidence of species variability stated by Darwin. Actually, Charles Darwin has read and mentioned in a letter to Henry Fawcett Trautschold’s pamphlet (privately reprinted abovementioned article) [20]. However, in his later textbook “The fundamentals of geology” (Part 3. Stratigraphy. M.: Izd-vo Mamontova i K. 1877, pp. 203, 204, 208), Trautschold questioned the sufficiency of the then available natural-science material to confirm the gradual nature of transition from simpler to more complicated forms, and warned against jumping to final conclusions. More obvious evidence of defection was found by L.Sh. Davtashvili in Trautschold’s 1878 paper published in a German journal (for more detail, see [21]).

In his accounts published in Priroda, Trautschold wrote about his impressions as a geologist from a long journey of Italy or from his trip to the oil-bearing regions of North Caucasus and Baku. Like his friend Petunnikov, Trautschold concerned himself with Russia’s practical needs, and kept looking for useful examples. For instance, the problem of street paving was pressing for Russia and both Trautschold and Petunnikov strongly objected to using cobblestones for this purpose. As Petunnikov put it, with seven-figure expenses, cobblestones “made the laypeople even more bilious”. Trautschold saw paving streets with stone tiles, such as he had observed in Italy, as a good alternative solution [22]. After his trip to North Caucasus and Baku, he described the prospects associated with these regions that were rich with oil deposits [23].

Trautschold’s keynote address “The importance of geology for agriculture” to the students of Petrovsky Academy of Agriculture and Forestry on 21.11.1876 was also published in Priroda. Having described several geological soil types of Russia and compared these to soil types in Western Europe, Trautschold pointed out how to improve Russian soils with mechanical hoeing and natural additions such as pomace, sand, alumina, manure, etc. Trautschold insisted that Russia needed its general soil map and emphasised that such maps had already been available for a number of regions: in particular, he mentioned the Moscow Governorate soil map prepared by himself. Trautschold had great expectations of the conscientious and inquisitive young people, whose knowledge, he thought, would help “soil cultivation reach high flourishing” in Russia, a predominantly agricultural country [24, p.98].
In its developmental initiatives, the Moscow City Council often relied on the researchers from the Petrovsky Academy and the Konstantinovskoy Land Survey Institute. Thus, not without Petunnikov’s suggestion, Trautschold participated in many such initiatives. He conducted an assessment of Mytishchi’s water reserves for the construction of public water supply; evaluated the suitability of natural asphalt, discovered near the city of Syzran, for paving Moscow’s streets; and participated in a geological exploration of the south-west region of Moscow for designing municipal sewerage [25].

In 1888 when Trautschold was leaving Russia, he was elected Honorary Member of MOIP. Petunnikov was awarded with this honour in 1909. In his obituary of Trautschold, he described his mentor and older friend as a serious scientist who had “done a lot of work in Russia and for Russia,” and emphasised his personal qualities: his unfailing optimism, a fine sense of humour, and an extremely pleasant manner of interacting with people [26].

In 1867, Louginine returned to Russia after his long stay abroad. In the autumn of the same year, upon the recommendation of Renard (who was the MOIP secretary) and Trautschold, he was elected a MOIP member, based on his work on the determination of specific volumes in the benzene homologous series, conducted at Henri Victor Regnault’s laboratory and published in a French scientific journal [27]. Louginine’s life was such that he was torn between Paris and Russia where he owned a large forest estate in Rozhdestvenskoye, a village in the Kostroma Governorate. It was there that, together with his brother Svyatoslav and with financial support of his father, he organised a rural savings and loan cooperative (‘tovarishchestvo’) to help poor peasants, having thus become a pioneer of the cooperative movement in Russia. In Paris, Louginine worked for many years with a famous thermochemist Marcellin P. Berthelot and published many articles in French scientific journals. In 1888-1907, Louginine taught at Imperial Moscow University where he founded a thermochemical laboratory in 1891 and trained and nurtured many talented thermochemists: I.A. Kablukov, V.V. Chelintsev, P.V. Zubov, A.Ya. Bogorodskii, and others. He also wrote a textbook of thermochemistry. During his roamings, Louginine crossed paths with Trautschold now and then. Being an outgoing person and quick off the mark, Trautschold often visited him both in Rozhdestvenskoye, which he mentioned later in his notes to the geological map of the Vetluga Uyezd [28], and at “La Pelouse,” Louginine’s villa in Switzerland.

Geologist and paleontologist N.P. Vishnyakov appeared at MOIP in 1875. Having started at Moscow University, he completed his scientific education at the University of Vienna in 1874. In Vienna he studied under professors Eduard Suess and Melchior Neumayr, and in Moscow, he studied geology under Trautschold. Recalling how he worked in Professor Trautschold’s cozy apartment, Vishnyakov wrote, “Our friendship lasted thirty years, unfailing whatever the circumstances and ending only with the demise of both of the old folks [Trautschold and his wife, Rosalia Karlovna]. May the earth rest lightly on them, my dearest and faithful friends! Those who will be exploring the Moscow suburban formations will not be able to do without studying his excellent, thorough investigations” [29].

In the 1870s, Vishnyakov published several articles on paleontology and geology in MOIP Bulletin and presented his papers at the MOIP meetings. Most of his work, however, was largely centered around the Moscow City Duma where he was one of the influential members and chaired the Commission on Public Benefits and Needs. This was where he met Petunnikov and where their heartfelt friendship began. Apart from the city council matters, their shared love for science strengthened the bond between them. Petunnikov taught his friend the intricacies of plant determination and prepared for him the herbariums of plants from the Moscow suburbs and Crimea. Petunnikov tried to get Vishnyakov’s memoirs of Moscow University published in Vestnik Evropy (‘Herald of Europe’) with the help of Wyrouboff who was well-acquainted with M.M. Kovalevskii, the editor of this magazine, but WWI interfered and the memoirs remained in manuscript.

All of the characters in our narrative knew each other and it was their friendship with Trautschold as well as similarity of their attitudes towards life and their scientific interests that brought them together.
5. Conclusion
The scientists mentioned in this article entered upon active life in the 1850s-1860s. It was the time when the enlightened part of the society was feeling a huge upswing of creative energy in anticipation of the reforms and at the very first steps in the implementation of liberal reforms of the early 1860s. Energetic, positive, open-minded and freedom-loving, Trautschold perfectly answered the aspirations of young people, their desire to fulfill themselves in science and beneficial public activities. First acting as a mentor, he soon became a cordial friend to his mentees. All of whom were true patriots of their country and left the evidence of their material presence in Russian science and culture. Louginine bequeathed to Moscow University the then world’s best equipment from his thermochemical laboratory as well as his vast and well-chosen scientific library that included the works by Trautschold. Wyrouboff donated to his compatriots the first collected writings of Alexander Herzen in Russian (Geneva, 1875-1879), which he compiled and edited on the request of the writer’s children in the times when Herzen’s works were forbidden in his mother country. Petunnikov left probably the best, in the botanists’ opinion, herbarium of plants from the Moscow governorate, which is stored as part of the Herbarium of the V.I. Komarov Botanical Institute of the Russian Academy of Sciences. The V.I. Vernadsky State Geological Museum of the Russian Academy of Sciences holds Vishnyakov’s mineralogical and paleontological collections to which contemporary researchers attach much value [30].

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