GRIGORY (GOTTHELF) FISCHER VON WALDHEIM (1771–1853): AUTHOR OF THE FIRST SCIENTIFIC WORKS ON RUSSIAN GEOLOGY AND PALÆONTOLOGY

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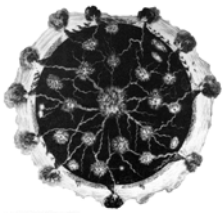
ABSTRACT

Sometimes called the 'Russian Cuvier', Grigory Fischer von Waldheim was born in 1771 in Waldheim near Freiberg in Saxony and graduated in 1792 from the Freiberg Mining Academy, where he studied under Werner and became friends with von Buch and von Humboldt. In Paris, he studied under Cuvier and the two became friends. In Russia, Fischer became Director of the Moscow University Natural History Museum (1804–1832), founder of the Moscow Society of Naturalists at Moscow University (1805), Corresponding Member (1805) and Honorary Member (1819) of the Imperial Academy of Sciences, and Professor (later President) of the Moscow Medical–Surgical Academy (1837), where he established its Natural History Museum. He gave systematic descriptions of materials in the Paris National Natural History Museum (1802–1803) and Moscow University's Natural History Museum (1805–1806). Using binomial nomenclature, he published the first scientific descriptions of the fossil fauna of Russia (1809) and the first descriptions of the fossil flora from around Moscow (1826) and the southwestern Urals (1840). He also wrote the first Russian monograph on geology and palaeontology (*Oryctography of the Province of Moscow*, 1830–1837). In effect, he founded palaeontology in Russia. His achievements were recognized during his lifetime and are remembered today in Germany and Russia, but are rather little known in the Anglophone world.



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1. FISCHER'S LIFE AND WORK BEFORE MOVING TO RUSSIA

Previous biographical writings on Fischer include Anon. (1836), Roullier (1855), Shchurovsky (1871), Zhitkov (1940), Büttner (1956), Zaunick (1961), Alexeyev and Barskov (1975), Romanova (1976), Gümbel (1978), Bessudnova (1999, 2002, 2004, 2006, 2011) and Teichert (2008). But his achievements are rather little known in the Anglophone world and the present paper seeks to remedy that situation.

1.1 Time in Germany

Sometimes called the 'Russian Cuvier' or 'Cuvier from Moscow', Johann Gotthelf (Grigory) Fischer (see Figure 1) was born into the family of a weaver on 13 October 1771, at the small town of Waldheim near Freiberg in Saxony. It was discovered that he had perfect pitch and a wonderful melodious voice, which circumstance was important for his future career. He was singing in the church choir when one day, passing through Waldheim, Cantor Kessel, a choir precentor from Freiberg, heard his beautiful high voice and urged Gotthelf's parents to send him to school in Freiberg. Fischer later wrote: "[m]y singing earned me a place in the team of gymnasiums" (Fischer von Waldheim 1850, p. 4).[1] His studiousness and good behaviour earned him the friendship of his fellow pupils and the goodwill of his teachers.

[1] As will be seen, Fischer became a member of the Russian nobility in 1833 and took the name Fischer von Waldheim. Here I refer to him as Fischer up to the year of his gaining his title and thereafter I use the name Fischer von Waldheim.

From 1790 to 1792, Fischer studied under Abraham Werner (1747–1817) at the Freiberg Mining Academy. There he became friends with Alexander von Humboldt (1769–1859), Leopold von Buch (1774–1853), Johann Carl Freiesleben (1774–1846), and Ernst Friedrich von Schlotheim (1764–1832), who were also students at the Academy at that time. Together, they made many excursions to quarries and mines, where Freiesleben had started to collect rocks and minerals. Years later, Fischer recalled his friendship with Alexander von Humboldt, writing:

> [m]y great happiness was that Alexander von Humboldt paid attention to me. This extremely busy man spared me much time in the evenings. His influence on my intellectual development was more than that of all of my previous and later teachers" (Fischer von Waldheim 1850, p. 7).

Figure 1. Johann Gotthelf Fischer von Waldheim (1771–1853). From Archives of Moscow Society of Naturalists

Fischer graduated from the Freiberg Academy in 1792, and for the next three years he studied medicine at the University of Leipzig, where Freiesleben was studying jurisprudence. The friends gathered together at their lodgings. For many years they corresponded and met occasionally when Fischer was in Central Europe.

In Leipzig, where Fischer also worked as a lecturer (*Privatdozent*), he made many other friends, including Johann W. Goethe (1749–1832). The two met in December 1796 and January 1797, and again in Jena, where Fischer also met Friedrich Schiller (1759–1805) (Büttner 1956).

In 1794, Fischer translated (from Latin to German) von Humboldt's *Aphorismi ex doctrina physiologiae chemical plantarum* (1793) as *Aphorismen aus der chemischen Physiologie der Pflanzen*. It was his first publication. The same year he took his bachelor's degree in medicine. Then, in 1795, he published a work on the functions of the fish swim bladder. Two years later he was awarded a doctorate in medicine from Göttingen for his work on animal respiration. Fischer worked there as a lecturer (*Privatdozent*) and was later awarded a PhD by the University of Leipzig (Büttner 1956).

In 1797, Fischer was invited by Alexander von Humboldt to join him and his brother for travel in Italy. Fischer and the Humboldt brothers began their trip in the summer in Dresden, passing through Prague to Vienna. In Italy, their plans changed. Alexander went with Leopold von Buch (1774–1853) to Salzburg where they made

meteorological observations. Fischer and Wilhelm von Humboldt went to Paris, where Alexander arrived later. In 1798, Fischer published a translation of a book on plant nutrition and soil fertility by Jan Ingenhousz (1730–1799), the Dutch-born British physician and scientist best known for studies of photosynthesis (Fischer 1798). Alexander von Humboldt wrote the introduction. The interest in soils manifested itself later in Moscow when Fischer was Director of the Moscow Society of Agriculture (from 1820 to 1835).

1.2 Time in France

In Paris, Fischer studied comparative anatomy under Georges Cuvier (1769–1832) and soon gained his approbation and friendship by accurate work, honesty and diligence. In 1801–1802, Fischer translated Cuvier's lectures into German and published them in two volumes.

Fischer also studied the collections of the Paris National Natural History Museum and described them systematically. He considered that the main thing was "not the golden glitter of boxes" but the scientific ideas underlying the system according to which the exhibits were arranged (Fischer 1802–1803). Thus he was accepted in the best European museums, which at that time were not only the repositories of collections but also original scientific research institutes.

In Paris, Fischer also met and became friends with many prominent scientists: the biologists Geoffroy de Saint-Hilaire (1772–1844), Bernard Germain Étienne de la Ville-sur Illon, comte de Lacépède (1756–1825) and Jean-Baptiste Lamarck (1744–1829), the geologist and industrial scientist Alexandre Brongniart (1770–1847), the crystallographer René-Just Haüy (1743–1822), and others. The interactions with such men greatly widened the range of Fischer's scientific interests.

In 1798, Fischer was invited to the University of Mainz (then occupied by France) to take up the Chair of Natural History, and a year later was appointed Professor and Librarian of the Central School of Mainz. In the library, he discovered archival materials relating to the early history of printing and activities of Johannes Gutenberg—the inventor of printing. Fischer wrote several works about the Bible and other monuments of printing, which served as the beginning of his studies of the history of printing. But he was chiefly attracted by the natural sciences.

In 1801, Fischer married Katharina Renard (1783–1850) in Mainz. Their first child, Alexander, was born in 1803.

2. LIFE AND WORK IN RUSSIA

2.1 Invitation to Moscow

In 1803, Moscow University's Natural History Museum received a unique gift from Paul G. Demidov (1738–1821), a former student and friend of Carl Linnaeus. Demidov's family was extremely wealthy from the manufacture of armaments. He donated his library, a cabinet of natural history, and funds for the upkeep and enlargement of the cabinet; and he also endowed a professorship of Natural History—the Demidov Chair. In the same year, a new charter for the University was approved, according to which it would be not only be an educational but also a scientific institution. From his position as Professor of Natural History at the University of Mainz, Fischer was invited to take up a Chair at Moscow University. He accepted the offer, declining the offers of a professorship in Jena and head of the comparative anatomy museum in Würzburg.

Fischer arrived in Russia in 1804, along with some other German professors, to become Professor Ordinarius and Director of the Moscow University Natural History Museum. He was only thirty-two. He had to be concerned with geology, mineralogy, and

zoology; and he had to lay the foundation stones in all these sciences, arranging the different museums, preparing catalogues for them, writing guides, and delivering lectures in the different subjects (Shchurovsky 1871, p. 45).

Thus Fischer's activities in Moscow were many-sided. He was soon known as Gotthelf Ivanovich, and then Grigory Ivanovich, in the Russian style.

2.2. Director of the Moscow University Museum of Natural History

In 1805, the Moscow University Natural History Museum was opened to the public, thanks to Fischer's energetic efforts. The minerals were arranged according to the system of Fischer's teacher at Freiberg, Abraham Werner, which was then generally accepted in European museums. Fischer corresponded with Werner prior to his death (Fischer 1818).

The exhibition of shells was based on the system of Lamarck, who first proposed the term 'invertebrates'. Fischer (1806) published a brief description of the six rooms devoted to animals and a plan of the Museum and its Laboratory. In the first room there were specimens of mammals and shells; but the centre attracted attention by a display of a number of lovely minerals. Minerals were also placed in the cabinets of the second hall. A further hall was filled with enormous fossil bones (such as mammoths). In the other three halls was the Demidov collection: shells, precious stones, large specimens of minerals, a collection of corals and sponges. Much space was occupied by books and manuscripts. A private collection, contained in a locked drawers, was set aside by the wish of the donor, to be used to teach students. The museum occupied about 1,000 m^2 (Fischer 1806).

In the same year, Fischer founded the first scientific society in Moscow: the Imperial Moscow Society of Naturalists at Moscow University. He was Director from 1805 to 1822, and thereafter he served as Vice-President. The Society was founded for the promotion of the study of the geology and mineralogy of Moscow Province (*Oblast*) and for the provision of interesting and significant new specimens for the Museum. Fischer was elected a Corresponding Member of the Imperial Academy of Sciences in 1805.

In 1806–1807, Fischer published three large volumes of catalogues for the Demidov Museum. In the first of these he described the enormous library (Fischer 1806a). The second volume (Fischer 1806b) gave detailed scientific descriptions, for the first time in Russia, of 3,850 samples of minerals, rocks and fossils. The third volume (Fischer 1807) presented a systematic collection of fossil animals and plants. The whole was a monumental work, and nobody thereafter made catalogues of the University Museum in such detail. Emperor Alexander I awarded Fischer a diamond ring for the description of the museums, which was of special symbolic significance in Russia.

Unfortunately, however, the greater part of the Museum collections and Fischer's personal effects were lost in the great fire of Moscow in the autumn of 1812, caused by the French invasion of Russia. Nevertheless Fischer managed to save some of the valuable specimens and remove them to Nizhny Novgorod to the east of Moscow. After the war, with the retreat of Napoleon's armies, the exhibits returned to Moscow but by then they only filled one hall out of the six before the fire.

In 1813, the year after the French retreat from Moscow, Fischer set to work to restore the Museum. The surviving documents show that the Museum collections were quickly restocked with gifts from patrons of art, members of the Moscow Society of Naturalists, and other Russians, and in particular the wealthy industrialists of the Demidov family. Fischer believed that rewarding donors for their gifts to the Museum was an encouragement to others to do the same and most donors received medals and decorations as a result of his petitioning. In 1824, Fischer published the first catalogue of the Museum of Natural History, as restored after the fire of 1812 (Fischer 1824). The systematic collection of minerals and gemstones contained 3,093 samples.

In February, 1822, the Trustees of the Moscow Educational District received an application from Fischer (Archive MSN, File 55, Sheet 1), with the request to purchase the collection of Johann Carl Freiesleben, which included such lines as:

> Your Excellency will be aware that the mineralogical part of the University Museum has greatly increased; but its systematic order has gaps and lacks minerals that are absent from Russia. These gaps are very significant for public lecturing. . . . Now we have an opportunity to fill up such gaps in a rather favorable manner. Mining Counselor I. Freiesleben in Freiberg, a disciple of the well-known Werner and known by his publications, has a mineral collection, on which he worked for thirty years. . . . Though this collection does not consists of large pieces, it is especially well adapted for lecturing. . . . This collection was not put together by a mineral dealer for sale, but by an expert. Each sample has its own significance and their price, considering the number of samples, is quite low.[2] I consider it my duty to recommend this collection to your Excellency, first because it is completely systematic, and second because it is not expensive (Archive MSN, File 55, Sheet 3–4).

Fischer's recommendation was duly accepted and the first consignment (eighteen boxes of minerals) was sent from Germany and arrived at the University in 1825. Other parts of the collection arrived later. In 1827, Fischer published a description of Freiesleben's oryctognostic (mineralogical) collection, classified according to Werner's system. He made a formal presentation of the collection in 1829 at a session of the Moscow Society of Naturalists. In 1840, in a report on the Mineralogical Cabinet, Professor Grigory Shchurovsky (1803–1884), Curator of the Cabinet at that time, stated that: "the fine and comprehensive collection of Freiesleben represents all his discoveries, as well as those of Mohs and many other mineralogists" (Department of SHM, Fund 404, File 22, Sheet 46 *verso*).

In 1830, Fischer published a description of Freiesleben's geognostic collection of minerals and fossils (938 samples), classified according to Werner's system. The Freiesleben collection included a collection of minerals from the slate mountains of Mansfeld in Saxony-Anhalt. This was the Museum's first regional foreign collection, with 1,026 samples and was "notable for its excellent impressions of animals and plants on cupriferous calcareous slates" (Department of SHM, Fund 404, File 22, Sheet 47 *recto*).

2.3 Palaeontological work

Fischer soon started on the description of specimens from the Museum collections that were new to science. Museum collections have long made a substantial base for the description of new taxa of fossil animals and plants. In 1806, he published a number of short works in the Moscow Society's *Bulletin*. This was the beginning of the publication of a series of works, which in effect formed the foundation for geology and palaeontology in Russia.

As an experienced naturalist, Fischer was particularly interested in one of the items donated to Moscow University by the former President of the Russian Academy of Sciences, Princess Ekaterina Dashkova, in 1807. He immediately realized that it was part of the jaws of a fossil animal hitherto unknown to science. The type-specimen of the genus, *Elasmotherium sibiricum* Fisch. (1809) was described by Fischer. The species was based on the left hemi-mandible with four molars and an alveolus of the third premolar (see Figure 2). In his notice (Fischer 1808) Fischer suggested a genus name,

[2] *I.e.* 5,400 Saxon thalers or 21,600 roubles in bank notes, with credit for some years and repayment at 4% annual interest.

Elasmotherium, and the species name *sibiricum* was proposed the following year (Fischer 1809). It is now known to be a kind of giant rhinoceros.

Following this, Fischer published a letter about the discovery of another fossil animal unknown to science, naming it *Trogontherium* Fischer, the type genus (with the species being named *T. cuvieri* Fisch., 1809—there being only one species in the genus). It was a kind of giant beaver. Then came his work (Fischer 1809) generalizing about new genera of fossil mammals and using binomial nomenclature for the first time in the Russia literature (Zhegallo *et al.* 2005). However, during the Patriotic War of 1812 the greater part of the Dashkova collection was lost and a only a mandible of the *Elasmotherium* survived the evacuation to Nizhny Novgorod. Rescued by Fischer, the specimen is now kept in the Palaeontological Museum of the Russian Academy of Sciences.

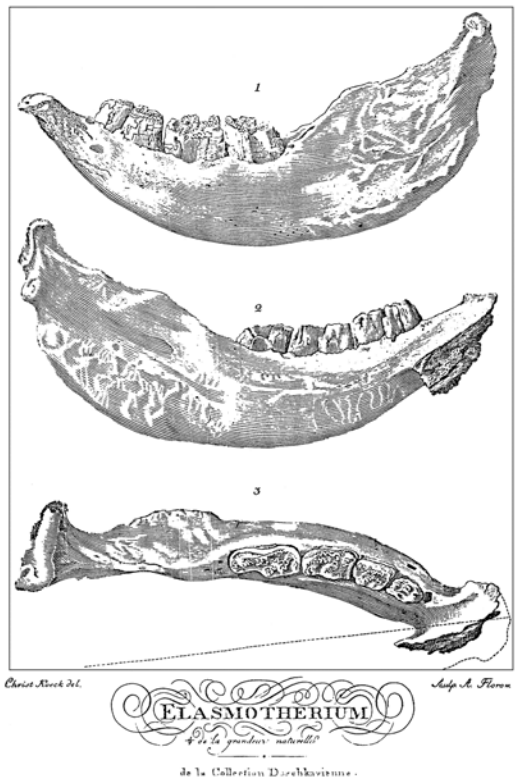

Figure 2.
Drawings of Elasmotherium sibiricus *from the collection of Princess Ekaterina Dashkova, published by Fischer in 1808 in his work* Notice d'un animal fossile de Sibérie inconnu aux naturalistes (l'Elasmotherium de Sibérie).

In 1809, the Minister of Education and President of the Moscow Society of Naturalists, Count Alexey K. Razumovsky, proposed a draft plan for the study and description of the Moscow Province (or Region) (*Moskovski Oblast*). The geological and mineralogical descriptions were entrusted to Fischer, with the help of Associate Professor Andrew M. Tauber of Moscow University. So, in 1809, the first comprehensive geological expedition was initiated in the Moscow region, under Fischer's leadership. The many specimens acquired during the expedition enriched the museum collections and provided new materials for research. Fischer and Peter M. Druzhinin, Director of the Moscow gymnasium and editor of the *Magazine of Useful Inventions in the Arts, Handicrafts and the Newest Discoveries in the Natural Sciences* from 1806 to 1811 worked for over two years in the neighbourhood of the capital, and also in the Zvenigorod, Vereya, Mozhaysk, Ruza, Volokolamsk and Voskresensk districts. The results of their studies were published by the Moscow Society of Naturalists, and the new

specimens were added to the University Museum's collections. Unfortunately, however, the project was not fully realized, as war intervened in 1812. Its incomplete implementation had rested largely on Fischer's shoulders.

In 1809, Fischer published the first scientific descriptions of a Russian fossil fauna using binomial nomenclature: 'Sur les coquiles fossiles dites Terebratules' (see Figure 3). It was the beginning of his series of works under the general title *Notice des fossiles du Gouvernement de Moscou* and began with a systematic study of the sediments of Central Russia. Fischer provided the first detailed analysis of the shells of what was then a new genus, *Rynchonella*, with the type species *R. loxiae*; and also the species *Terebratula luna* (now *Russiella luna*). These were observed only as impressions or negative images of shells but modern palaeontologists still recognize the species. In effect, Fischer founded Russian palaeontology. So it was that in 2009 the Moscow Society of Naturalists celebrated the 200 years from the date of the first geological expedition in the Moscow region, and the Palaeontological Institute held a conference on '200 Years of Palaeontology in Russia'.

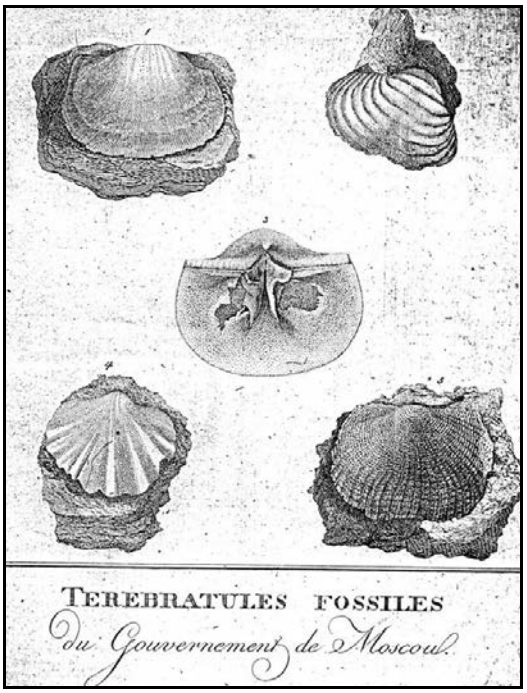

Figure 3.
Images of Terebratulae from Fischer's work 'Sur les coquiles fossiles dites Terebratules' (1809).

Fischer also discovered traces of marine invertebrates in the Carboniferous deposits of the Moscow region—vermiform trace-fossil organisms *Zoophycos* that he found on the estate of Count Nikolai Petrovich Rumyantsev (1754–1826) at Kaïnardji, about twenty-five kilometers east of Moscow.[3] He interpreted them as the 'fingerprints' of *Coelenterata* (sea feathers) (Fischer 1811b). In his 'Recherches sur les encrinites . . . ' he gave the first description of *Zoophycos*: *Umbellularia longimana*. Following his discovery Fischer decided to study the area near Kaïnardji in detail and worked there for two summer seasons, compiling a large-scale map of the area (see Figure 7). Fischer also wrote a manuscript about the Rumyantsev estate of (its agriculture), which is kept in the Russian State Library.

[3] His father Peter Rumyantsev led the Russian forces in the war against Turkish invaders following which a peace treaty was signed at Kaïnardji in 1774. This marked an expansion of the Russian Empire and a decline of Ottoman influence in Europe.

In 1819, Fischer was elected an Honorary Member of the Imperial Academy of Sciences in recognition of his studies of Russian geology (Soloviev, Bessudnova and Przhedetskaya 2000). In 1829, he published a work in which he compiled a bibliography of the descriptions of fossils held in museum collections, going as far back as 1676 (Fischer 1829, Vol. 1, pp. 301–374). This was included in what was the world's first bibliographic directory for palaeontology, published as a separate book (Fischer von Waldheim 1834a), in which the term 'palaeontology' was introduced for the first time in Russia.[4]

Fischer also published the first scientific descriptions of the fossil flora from around Moscow (Fischer 1826) and the southwestern Urals (Fischer 1840). Permian fossil plants collected by the mine director Friedrich Wangenheim von Qualen (1791–1864) at the copper mines of the Orenburg and Perm provinces were described by Fischer von Waldheim in this work (see Figure 4). Alexandre Brongniart later studied several samples from this collection in detail (Naugolnykh 2001).

Figure 4,
A display case with Permian fossil plants collected by the mine director Friedrich Wangenheim von Qualen from the copper mines of Orenburg and Perm provinces. These were described by Fischer von Waldheim in 1840. Permanent exhibition at the Vernadsky State Geological Museum, Moscow. Created in 1997. (Photo by Zoya Bessudnova, 2012.)

2.4 Journey to Central Europe

In 1830, after twenty-five years of service at Moscow University, Fischer was granted permission to spend a year abroad. The purpose of so long a stay in Central Europe was "to survey the main museums and to exchange data and ideas with the first class representatives of natural sciences" (Heiman 1871, p. 10).

Fischer also visited his native town of Waldheim. He met with relatives and friends and made a pilgrimage to his parents' grave in the town cemetery. But he spent only one night in his home town (Anon. 1836), for well before the planned completion of his trip he was informed of an outbreak of cholera in Moscow and felt it necessary to return. Fischer was the father of a large family: a son and four daughters. He loved his

[4] According to the Russian *Geological Dictionary* (Krishtophovich [ed.] 1955, Vol. 2, p. 116), the word was coined simultaneously by Fischer and the French naturalist Henri de Blainville (1777–1850), but in fact the Frenchman had precedence (de Blainville 1822).

family and his wife was in poor health during her later years and he knew he had to take care of her. Heiman has written:

> Neither the work begun nor the entreaties of the scientists and friends of his youth could keep him from making a difficult journey in late Autumn. He chose the performance of his duties as father of his family and hastened to risk the dangers of infection by the disease; for at that time it was generally considered that cholera was much more contagious and dangerous than plague (Heiman 1871, p. 8).

Apparently, however, the impressions gained during Fischer's travels gave rise to the idea of establishing a large public national museum (Fischer de Waldheim 1833). Unfortunately, though proposed by Fischer in 1833, the project of establishing a National Museum in Moscow was not carried out in his lifetime.

In 1832, Fischer resigned from the University and transferred the management of the Moscow University Natural History Museum to his son Alexander (1803–1884), who, however, stayed in the position for only two years, though he subsequently 'inherited' the position of Vice-President of the Society of Naturalists for the period 1853–1872 and then served as President from 1872 to 1884, after his father's death. After stepping down from his position at the Museum and from the presidency of the Society of Naturalists, Fischer Sr concentrated on his scientific work and his responsibilities as the Society's Vice-President, and continued to build up and describe the Museum collections.

2.5 Fischer's principal work in geology

Fischer most important work was titled *Oryctographie de gouvernement de Moscou* (1830–1837)—the first Russian monograph on geology and palaeontology. It contained physical-geographical, geological and palaeontological descriptions (with description of ninety-eight species of animal fossils fauna, from protozoans to vertebrates) of the Moscow region, and also a table with fifty-one images of fossils from different stratigraphic units, as well as the first geological map of the Moscow region (Fischer von Waldheim 1830–1837) (see Figures 5–10).

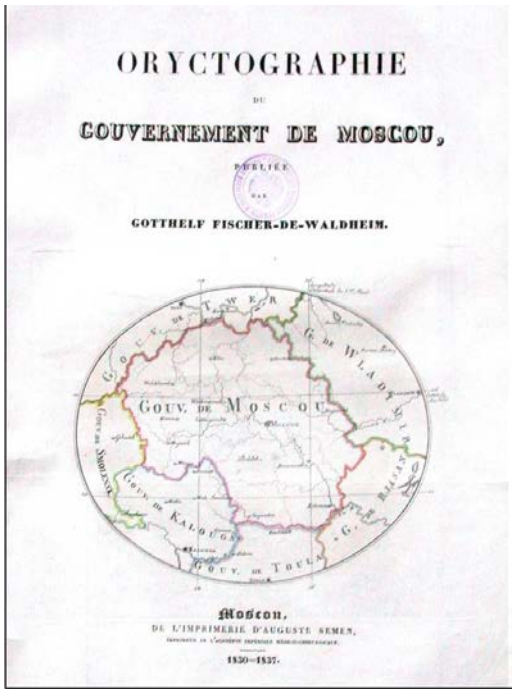

Figure 5.
Title page of Fischer's treatise on the natural history of the Province of Moscow (Oryctographie de gouvernement de Moscou, 1830–1837).

In *Oryctographie* Fischer summarized his ideas about the sequence of strata in the Moscow Province. He considered the oldest to be the 'Moscow System' (Jurassic or Lower Oolite). For the subdivision of the Moscow region he used mainly lithological methods, so that in some cases subdivisions (as recognised today) were conflated, and coeval units were disconnected. Nevertheless, the modern palaeontologists A. S. Alexeyev and I. S. Barskov have valued the work's palaeontological contribution, comparing it with the monographs of the Western European palaeontologists Alcide d'Orbigny and James Sowerby (Alexeyev and Barskov 1975).

Fischer was among the first to try to understand and explain the replacement of organic by mineral matter, the petrification process, which results, for example, in the development of silica over a mollusk, accompanied by ferruginization. Such mollusks have been found near Vasilëvo, to the northwest of Moscow. Fischer described a specimen as an original fossil belonging to the class of Cephalopodes, which he defined as *Nautille fossile* (Fischer von Waldheim 1834b, pp. 255–266). It was placed in the University Museum. His *Oryctographie* was awarded the Demidov Prize (1,428 roubles—about two years' income for a University professor) established by Paul Demidov: the only academic research award in Russia at that time. (Later Demidov Prize winners have included the chemist Dmitri Mendeleev, the surgeon Nikolay Pirogov, the palaeontologist Christian Pander, and the geologist Gregor Helmersen.)

Fischer was always interested in new results in geology. He met Roderick Murchison in Moscow, and corresponded with him during his field trip across Russia. Murchison gathered the necessary and sufficient evidence for the establishment a new system, the Permian, as announced in his letter to Fischer von Waldheim, published in the *Mining Journal* (Murchison 1841). A letter from Fischer von Waldheim to Murchison described a new genus of fossil saurian *Rhopalodon* (Fischer von Waldheim 1841) found in cupriferous sandstones and attributed to the Permian.

Figure 6. Fischer's geognostic map of the Province of Moscow from Oryctographie (1830–1837). *Red = Limestone; Yellow = Gypsum; Darker yellow (now faded and indistinct) = Sandstone; Blue =Ferruginous alluvium.*

Fischer made a particularly detailed study of the area around Kaïnardji, the estate of his friend Count Nikolai Petrovich Rumyantsev and prepared a detailed geological map of the area (see Figure 7).

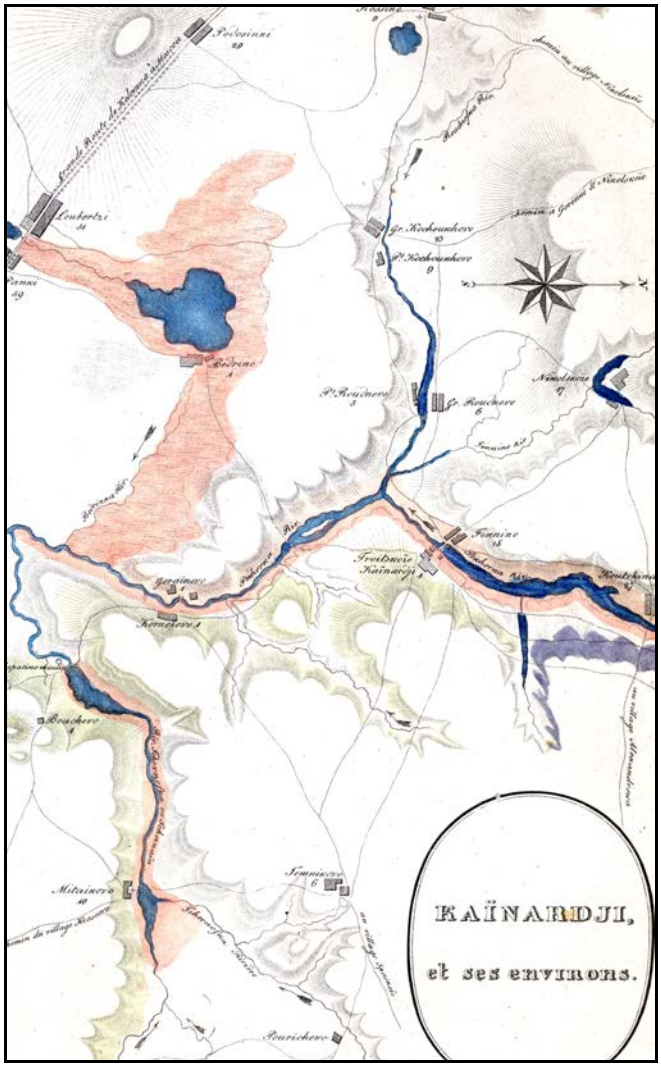

Figure 7. Fischer's geologic map of the area near Kaïnardji from Oryctographie. *Coloured in the original. For key, see Figure 6.*

2.6 Mineralogical work

Fischer also worked on mineralogy. In 1806, he described the minerals thallite (called epidote by Haüy) and siberite (called tourmaline by Haüy) from the Urals (Fischer 1806e, 1806f), describing the forms of the crystals and comparing the results of the chemical analyses of the Ural minerals with the results of studies of samples from Arendal in Norway and Dauphiné in southeastern France by the French chemist Louis-Nicolas Vauquelin (1763–1829). In the same year, Fischer wrote a note on the chemical analysis of samples of turquoise, performed by the German chemist and professor of chemistry and pharmacy at the University of Frankfurt (Oder) Johann Friedrich John (1782–1847)

(Fischer 1806a). These publications were the beginning of a series of his works that promoted the development of descriptive mineralogy in Russia.

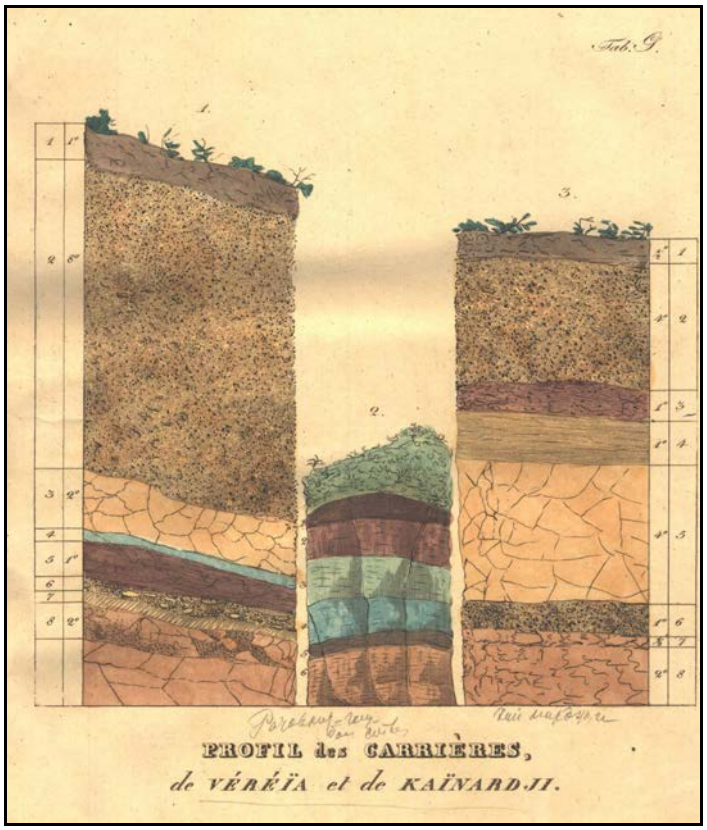

Figure 8. Three quarry profiles at Véréïa (near Mojaïsk [Mozhaysk], west of Moscow) and Kaïnardji, as depicted by Fischer in Oryctographie (1830–1837).

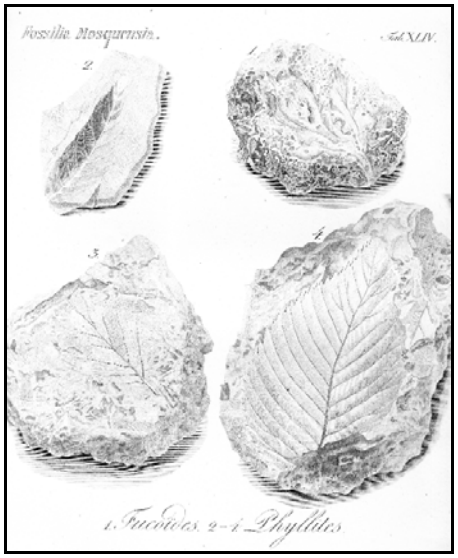

Figure 9. Images of fossil plants from Fischer's Oryctographie (1830–1837).

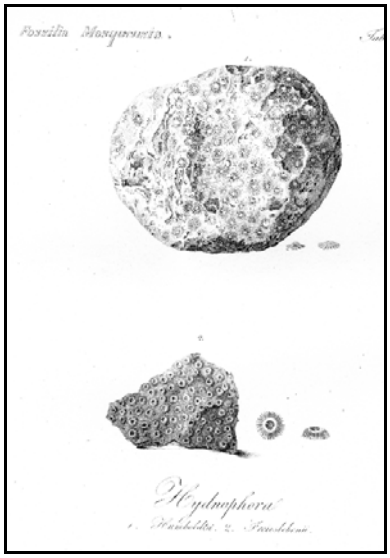

Figure 10. Images of the coral genus Hydnophora, *first described by Fischer in* Oryctographie (1830–1837). *Two species were named by him in honour of von Humboldt and Freiesleben:* Hydnophora Humboldtii *and* Hydnophora Freieslebenii.

Fischer emphasized the importance of Haüy and Werner's works in mineralogy, but in the preparation of mineral classification and the allocation taxa of higher order he gave priority to chemistry. In his opinion: "the chemist must create general distinctions, such as classes, orders and families, but the compiling of genera and species should be given to the mineralogist" (Fischer 1811a, p. 17). A quantitative approach to the investigation of substances, which at the time was a major preoccupation in chemistry, began to spread to mineralogy. Fischer organized the quantitative analyses of minerals specifically to help clarify the places of mineral species in systematic arrangements.

After the Patriotic War of 1812, Fischer resumed his scientific work and published a systematic arrangement of minerals (as a textbook for students), largely based on the classification used for the Moscow museum's minerals. This classification of minerals (Fischer 1815), was found by the present author. It is not in the standard bibliographies of Fischer's work.

Fischer also gave the first description of the new mineral 'ratofkite' (Fischer 1812), utilising a chemical analysis of the material requested in 1811 from Johann John in Germany (Archiv MSN, file 2, sheet 90). A comparison of the mineral classifications given by Fischer in the second volume of his *Catalogue* (Fischer 1806d), the *Onomasticon* (Fischer 1811a), *Onomasticon* (Fischer 1815), *Oryctognosy* (Fischer 1818–1820), and the *Catalogue* (Fischer 1824) shows the evolution of his views on the role of chemistry and crystallography in mineralogy, indicating his independent views on the systematic classification of minerals—not the uncritical emulation of Werner's ideas shown by some Russian mineralogists at that period (Bessudnova 2002). After a careful consideration of Fischer's mineralogical works, I conclude that the opinions of Shchurovsky (1871, p. 9), Mazarovich *et al.* (1940, p. 26) and Barsanov (1959, p. 34)—that Fischer blindly followed Werner in his *Oryctognosy* (1818–1820) and had little interest in mineralogy—is incorrect.

Fischer supplied all his works with detailed information about the history of the objects of study. His pupil, Shchurovsky, rightly noted: "Fischer . . . was always particularly strong on the historical side of any object that he described. It helped him that he had a great command of languages, both ancient and modern" (Shchurovsky 1871, p. 10).

2.7 Entomological work

According to historians of entomology, Fischer's fundamental work *Entomographia imperii rossici: genera insectorum systematice exposita et analysi iconographica instructa* (5 vols, 1820–1851) is one of the most valuable works on entomology in Russia. In it he described Russian beetles, butterflies and insects and figured many of them in more than 140 plates, some coloured (see Figures 11 and 12).

Fischer published lists of all those who sent him material for examination. It came from all over Russia, including the cities of Moscow, St Petersburg, Arkhangelsk, Yaroslavl, Perm, Kazan, Astrakhan, Smolensk, and many others. He also received material for research from Austria, England, Germany, Italy, Sweden, *etc*.

2.8 Fischer's last visit to Central Europe

In 1842, Fischer von Waldheim made his last trip to Central Europe. His son Alexander recorded in his autobiography that he "accompanied his father during his four-month trip to the twentieth congress of German scientists in Mainz" (A. Fischer von Waldheim 1855). In St Petersburg, on their way abroad, they met with members of the Russian Academy of Sciences and the Mining Institute. The listed cities visited and the famous scientists of the time that he met took up nearly a page, and evidences Fischer von Waldheim's extensive contacts with representatives of advanced scientific thinking in

Europe. Everywhere the father and son stopped, they visited and examined botanical gardens, natural history collections, anatomical studies, libraries, and other establishments. Alexander recalled that: "in his youth, he had the good fortune to become acquainted in his parents' house with many distinguished travellers and famous foreign scientists" (A. Fischer von Waldheim 1855). Among them were Alexander von Humboldt, Christian Ehrenberg, Gustav Rose, Robert Brown, Robert Murchison, and Philippe Édouard de Verneuil.

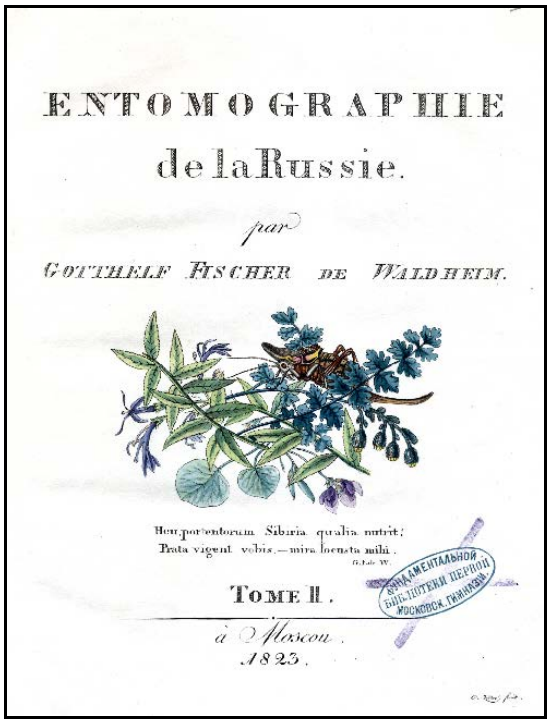
ENTOMOGRAPHIE
de la Russie.
par
GOTTHELF FISCHER DE WALDHEIM.
Hem portenborum Sibiria qualia nutrit;
Prata vigent vobis, — mira benesta mihi.
TOME II.
à Moscou.
1823.

Figure 11. Title page of Volume 2 of Fischer's Entomographia imperii rossici (1825–1828). *Coloured in the original.*

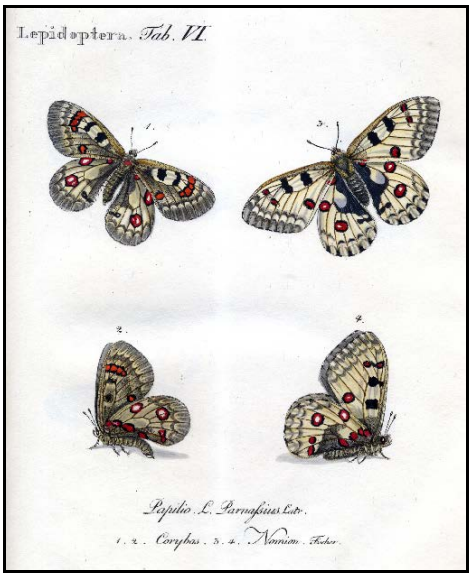

Figure 12. Images of Lepidoptera *from Fischer's* Entomographia imperii rossici (Vol. 2, 1825–1828). *Coloured in the original.*

2.9 Honours, membership of scientific societies and academies

In recognition of his numerous achievements and contributions, Fischer was elevated to the nobility in 1833, and was then titled 'Fischer von Waldheim', revealing his affection for his native town.

Fischer was Professor, and from 1817 the Vice-President and from 1837 the President of the Moscow Medical–Surgical Academy, where he also established its Natural History Museum, the collections of which were transferred to the University Museum in 1842.

He was a member of over seventy scientific societies, academies and organizations in Russia and abroad. In 1830, he was recognised for his distinguished service over twenty-five years and was elevated to the position of State Councilor, which corresponded to the rank of general in the military.

For his contributions and achievements in Russia, he received numerous awards: St Vladimir Order (4th class 1808, 3rd class 1826), St Stanislav Order (2nd class 1832, 1st class 1835), St Anna Order (2nd class 1818).

In 1847, Moscow solemnly marked the fiftieth anniversary of Fischer's scientific activities, with almost all the major European and North American scientific societies being represented. In connection with the anniversary, Emperor Nikolay I awarded him the Order of St Anna (1st class), decorated with the Imperial crown—a hereditary title that conferred nobility on both Fischer and his descendants; and the King of Prussia awarded him the Order of the Red Eagle (*Roter Adlerorden*). A gold medal with Fischer's portrait was coined in honour of the jubilee.

3. EPILOGUE

Grigory Fischer von Waldheim published about 250 scientific works, some of which were published in Russian. His most important works were the *Entomographia of Russia* (5 vols, 1820–1851) and the first Russian monograph on geology and palaeontology, the *Oryctography of Moscow Province* (1830–1837), which brought him international recognition.

His pupils—the mineralogist Alexey L. Lovetsky, the biologist and palaeontologist Charles Rouillier, and the geologist G. E. Shchurovsky—became well-known Russian professors and gave much of their time and energy to Moscow University's Natural History Museum.

Towards the end of his life Fischer von Waldheim became blind, in part because of his long and laborious studies, including microscopic observations. But he never ceased his tireless scientific activities for even a day.

His contemporaries remembered him as a person of "height a little more than average, strongly built, a little stout, of dignified bearing, and handsome. His blue eyes expressed his constant good nature, insight and sometimes his good-natured irony. The great scientist and virtuous man—such was Fischer" (Heiman 1871, p. 10).

Fischer liked to read Schiller and Horace, and listen to Händel, Haydn, Mozart and Beethoven. He was a gifted musician and by temperament a poet. He composed an agonal poem, and set it to music. It was played in the church at his burial service.

Grigoriy (Gotthelf) Fischer von Waldheim died on 18 October 1853 and was buried in the Lutheran cemetery near Moscow (today's Vvedenskoe cemetery, where Germans used to be buried). The Moscow Society of Naturalists has erected an obelisk of red granite on his tomb, topped with a crown in the form of a funeral urn with a gilt wind rose on its cover (see Figure 13). On one side of the obelisk there is a medallion with a low-relief portrait of Fischer; and on another the inscription: "To the famous scientist, who built an indestructible monument by his discoveries and publications and the foundation of the Imperial Moscow Society of Naturalists".

In effect, Fischer founded palaeontology in Russia. His achievements were recognized during his lifetime and are still remembered today in Germany and Russia but are rather little known in the Anglophone world. However, he is well remembered today in the Vernadsky State Geological Museum of the Russian Academy of Sciences. There is a display case with his portrait and a description of his virtues and accomplishments in one of the permanent exhibition halls. Many of the Museum's collections with their scientific descriptions were made by Fischer von Waldheim and are still preserved there.

Unfortunately, only one direct descendant of Fischer von Waldheim is alive today—the philologist, now retired, Elena Fassman of St Petersburg (see Figure 13). But she has no children.

Figure 13.
Elena Fassman by the grave of her famous great-great-grandfather. Moscow. Vvedenskoe Cemetery. 28 October, 2011. Photograph by Zoya Bessudnova.

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