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Mario Parise Carla Galeazzi, Roberto Bixio, Carlo Germani











UNDERGROUND HISTORY OF DOMODEDOVO DISTRICT

Ekaterina Yanovskaya and Dmitry Garshin

Russian Geographic Society
127411, Moscow, Dmitrovskoe sh. 131-1-132, 142800 Moscow region, Stupino, Frunze str. 3-1-56
katherinyanovskaya@gmail.com - sso.tetis@gmail.com

Abstract

Limestone (also called white stone) is a material used for the building of White-stone Moscow. In 1365 after the Vsesvyatsky fire, when most of the wooden Kremlin was burned, the Great Prince Dmitriy Donskoy enjoined to build the Stone Moscow. Within two years the Kremlin was rounded by stone walls. Beside the walls, churches, houses, and memorials were built - all of them constructed with limestone. Now we know many sites where the ancients mined the limestone. Some of them are open quarries (like Myachkovsky quarry), while others are underground mines developing many kilometers. The longest underground quarry of the Moscow region is the Sianovskaya quarry (about 18850 m long), which is located near the Sianovo village in the Domodedovo district. It is the most famous underground object in the Moscow region. Many tourists visit this quarry every year. Near this, there are many other large quarries on the left bank of the Pahra river. The most significant of them are Duginskaya quarry (about $5240 \text{ m} \log$), Yubileinaya quarry (about $4015 \text{ m} \log$) and Meshcherinskaya quary (about 5810 m long), as well as many other smaller ones. After the second part of XVII century a period of intensive mining of limestone started on this territory. Many settlements were founded for this purpose, and several kilometers of quarries were dug. During the last 35 years Moscow spelestological* groups have been surveying underground quarries of Moscow region. Some of them were discovered and explored but others are still not found. Now we can describe limestone quarries typology, different mining methods and age determination. We also have detailed maps of quarries. All of this can help us to study the mining history of our region. In this paper we will write about Domodedovo district, where the largest and oldest underground quarries of the Moscow region are located. Also we will make a short view of main quarry systems of the region.

Keywords: Moscow, limestone, Domodedovo district, Myachkovo limestone, quarry, history of Russia, spelestology.

Riassunto

Il calcare (chiamato anche pietra bianca) è un materiale utilizzato per la costruzione della White-Stone Mosca. Nel 1365 dopo l'incendio di Vsesvyatsky, quando il fuoco bruciò la maggior parte del legno del Cremlino, il Grande Principe Dmitriy Donskoy ordinò che a Mosca si costruisse in pietra. Il Cremlino fu completato in due anni con mura in pietra. Ma furono costruite anche chiese, case e monumenti, tutto in calcare. Oggi conosciamo molti luoghi dove gli antichi estraevano il calcare. Alcuni di essi sono cave a cielo aperto (come la cava Myachkovsky), mentre altri sono miniere sotterranee dello sviluppo di molti chilometri. La cava sotterranea più lunga della regione di Mosca è la cava Sianovskaya (circa 18850 m di lunghezza), che si trova nei pressi del villaggio Sianovo nel distretto di Domodedovo. È la struttura sotterranea più famosa nella regione di Mosca e molti turisti la visitano ogni anno. Nei pressi si trovano molte altre grandi cave sulla riva sinistra del fiume Pahra. Le più interessanti sono la cava di Duginskaya (circa 5240 m di lunghezza), la cava di Yubileinaya (circa 4015 m di lunghezza) e la cava di Meshcherinskaya (circa 5810 m di lunghezza), così come molte altre miniere e cave di dimensioni minori. Dopo la seconda parte del XVII secolo iniziò in questa zona un periodo di intensa estrazione di calcare. Molti insediamenti furono creati per questo scopo e furono scavate cave di molti chilometri di sviluppo. Nel corso degli ultimi 35 anni il gruppo speleologico "The Bat" ha indagato le cave sotterranee del distretto Domodedovo. Alcune di esse sono state scoperte ed esplorate, altre solo esplorate. Sulla base della nostra ricerca si discute qui la tipologia, i diversi metodi di sviluppo e la datazione delle cave potendo disporre di mappe dettagliate. Tutto questo può consentire di conoscere la storia delle miniere nel distretto Domodedovo. (n.d.r.: il termine Spelestology, che ricorre nel contributo, indica in Russia ed in altri paesi la speleologia in cavità sotterranee di origine antropica abbandonate).

Parole chiave: Mosca, calcare, distretto di Domodedovo, calcare di Myachkovo, cava, storia della Russia, spelestologia.

* Spelestology is a term for speleology and caving in abandoned artificial underground cavities used in Russia and several foreign countries.

Location

Domodedovo district is situated in Moscow region to the south from Moscow. Nowadays the administrative unit called Domodedovo district has been turned into Domodedovo town district. We will use a casual term of "Domodedovo district" in the meaning of "Domodedovo town district" in this paper. The district area is more than 818 km² and its population is about 150 000 people. The town and also the town district emblems have three limestone blocks on yellow and blue background, as a symbol of numerous limestone quarries in this area.

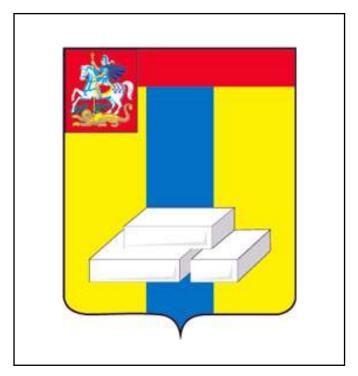


Fig. 1: blazon of Domodedovo district. Fig. 1: stemma del distretto di Domodedovo.

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The first mention of Domodedovo as a settlement can be found in the 15th century. The territories of Domodedovo district had been parts of Podolsk, Nikitsk, Serpukhov and Bronnitsy Provinces in the past. Now most of their lands are stand-alone administrative units. In this paper we will only discuss about the current territory of Domodedovo town district (Fig. 1).

Geology

The main rocks of the described area are Moscovian horizon limestone deposits of the Carbonic period. The main excavated layer is the Myachkovo limestone, the most useful one for stonework because its quality is nearly ideal for construction needs. Its main properties are: softness which allows using it in complicated decorative elements production; snowwhite color allowing to use it without any exterior trim; homogeneous structure without undegraded fauna skeleton inclusions.

The local names of excavated layers were:

poiasnik - designation unidentified;

tovarny - limestone of the best quality;

klinniy - probably this designation means the mining method using metal wedges;

tsokol'niy - lower quality limestone, firm enough to be used in foundation construction.

According to the *spelestological* zoning scheme, used in Russia, nearly all the territory of modern Domodedovo town district is a part of North-Eurasian *spelestological* country Middle-Russian *spelestological* province Moscow *spelestological* region Myachkovo *spelestological* district. Only a part of the Severka river valley in the Domodedovo district northeastern part is referred to Kolomna *spelestological* district (Dolotov, 2010).



Fig. 2: Dormition Cathedral, Moscow.

Fig. 2: cattedrale della Dormizione (Assunzione), Mosca.

The beginning of stone construction

The first white-stone buildings, mainly white-stone temples, appeared in the North-East of Rus' in the 12th century. One century later Christianity became so deep-rooted at this territory that Pagan Viatich barrows disappeared giving place to the Christian funeral rituals. This means that the majority of the Russian population became Christian.

The architecture character of the Kievan Rus' totally changed after Christianization in the 10th century. Rus' decorated itself with heavy trends of Christianity such as limestone temples and churches. Also limestone took a large part in civil construction and decoration. The first limestone temple after Christianization was built in Kiev at the end of the 10th century. It was Desyatinnaya Tserkov' which was founded by the Great Prince Vladimir the Great between 989 and 996 (Fig. 2).

The first stone buildings in the Moscow territories appeared only in the first half of the 14th century. There are various reasons for that. First of all, Moscow was too far from the centers of civilization at that time. Secondly, the Tatar yoke stopped the evolution of Rus' for almost a hundred of years. Also the locals did not demand to construct strong stone buildings as the territory of Moscow region was covered by forests with excellent construction timber. Forests were also used as shelters against enemies. The most important reason was surely the Pagan religion which deeply affected the minds of local people. Monumental Pagan temples were unnecessary due to natural forces worship. Inculcation of Christianity started the age of stone temples construction.

The first stone temples were built by foreign architectures invited to Rus' from Byzantine, Italy and other Christian countries. Becoming the Third Rome,

Moscow inherited Christian cultural and architectural traditions.

Mining history

At the time of beginning of the limestone construction the banks of the rivers surrounding Moscow probably looked differently than today. Thick deposits of limestone with erosion canals created by water flows were protruding near the water as island rocks. The most thick and unique deposits are situated on the banks of the Pakhra river downstream from Yam village in vicinity of Syanovo, Kamkino, Kiselikha, Novlenskoye, Kolychiovo, Semivragi, Kupriyanikha villages and also on the banks of the Rozhayka river near Nikitskoye village (Garin, 2004).

Domodedovo land is one of Russian limestone production historical centers. It was probably known since the colonization of these lands in the 11th - early 12th centuries (reign of Yaroslav the Wise and Vladimir Monomakh) that there are huge limestone deposits in Viatich lands along the rivers Oka, Pakhra, Moskva and Desna. Most of the transportation was performed with waterborne transport and multiple limestone rocks could be seen on the river banks. Scarp banks and deep ravines with a convenient horizontal approach to the layer of interest created favorable conditions for limestone mining in this region (Zagraevsky, 2008).

The earliest limestone excavations did not require underground workings and were performed by *raznos*'s - open pits excavating the best layer near the surface. For this reason underground excavations from the times of first white-stone temples construction (14-15th centuries) are nearly impossible to be found.

The largest and best known open-pit limestone excavation is situated in Upper Myachkovo village (nowadays Moscow region Ramenskoe district). It gave the name to the whole limestone stratum.

Governmental decrees and various social-politic issues sometimes halted limestone construction, and mine workings were stopped as a result of them. Such issues were, for example, the Tatar Mongol Yoke, Time of Troubles, Peter the Great's decrees forbidding limestone construction anywhere except St.-Petersburg vicinity. By the end of those periods limestone construction afresh started again and again. The beginning of the 18th century was the time of Emperor Peter the First's great reforms. In 1705 he issued a decree forbidding all the stone construction anywhere in Russia and obliging every citizen to hurl all efforts for building of new capital St. Petersburg. This decree was annulated only in 1741 after Peter's death. Intensive underground development Domodedovo district started approximately in that period. Probably it was caused by intensive limestone construction. It seems that the top layer of limestone had been exhausted and mine workers had to go deeper underground. Maybe there were some other reasons. However we still could not find the quarry older than

Such intensive region development is surely incidental to governmental ownership. As we know from history books, feudal land tenure was progressive only in the beginning of its existence, cooperating labor resources and protecting the producing class. As time passed, farm management was undergoing too little changes and landlords' main goal was often profit maximization rather than territories development. Governmental lands and peasants had much more economic liberties which allowed their intensive development. Trading between peasants and government or between peasants and other stone purchasers is mentioned in ancient acts many times.

A peasant could independently set product prices and bargain with the customer. Sometimes individual peasants with their own quarries acted as contractors. According to the description, saved in the Russian Ancient Acts Archive (RGADA), Nikita Pavlov, a peasant from Pakhrino village, supplied 20000 limestone blocks for the Peter's Palace construction in 1776. It was such a good deal for him that he became a First guild merchant and supplied 8000 more blocks for the Kremlin wall construction.

Pakhrino was a small village, owned by Peter's companion count A.D. Myenshikov in 1706-1727. After his exile this place was transferred into governmental manor and in 1732 became a center of Domodedovo horse-breeding district and also a center of limestone mining. White-stone horse stables and a new Tsar's house were built. This village was situated on one of the most important Russian roadways - the Kashira road. Now the village has disappeared but the largest quarry system of Moscow region is located nearby. Also there can be found one open-pit quarry and at least two more underground quarries which can not be explored because now their entrances are located in a private area.

According to archive data lime and limestone were transported from here to Moscow for the Kremlin and the Kitay-Gorod new walls construction.

Local temples and churches of Domodedovo district rebuilding was started in the mid-17th century. They were constructed of stone instead of the old timber. Limestone blocks were widely used in construction of Resurrect church in Bityagovo (1670-1671), the five-domed church in Kolychyovo village (1697), the churches in Domodedovo village (1731-1738) and Akulinino village (1743), Assumption church in Shubino village and Nikolas church in Lyamtsino village (1794), Archangel Michael church in Bunyakovo village (1809), the Holy Sign church with four-level bell tower in Lobanovo village (1851), etc. (Garin, 2004).

Villages of Kamkino, Churilkovo, Kiselikha, Novlenskoe, Kotlyakovo are also included in the Domodedovo district. New quarries are still being discovered and old ones are being enlarged in the vicinity of these villages.

Zherebyatyevo village is also an important place of mining history. It was established in Domodedovo district for limestone mining purposes in the mid-18th century. Several *bobyli* were resettled to its lands. *Bobyli* is an ancient Russian term of a peasant without socage, sometimes a poor one with no property.



Fig. 3: adze-axe from Verkhnekotlyakovskaya-3. Fig. 3: asce da Verkhnekotlyakovskaya-3.

Limestone production, being very important for the state industry, was poorly controlled by the government. It was a winter work as the peasants were free from farming in winter.

Huge quarry systems several kilometers long were mined in cooperative by the villagers. Small quarries and *raznos*'s could lay in individual peasant lands and be mined by a single family. The limestone mining process was performed using metal tools which were often handmade manufactured locally. These were various wedges, hammers, droves, pickaxes, adzes, etc. (Fig. 3).

Miners divided a monolith wall into parts inserting wedges into natural cracks to break out stone blocks. Primary stone manufacture was performed underground. They were shaped rectangularly with droves and adzes. The final manufacture was performed on the surface. After that, blocks were stored at the surface for at least one year to get the required properties. Only smooth blocks of a determined shape, size and color without any dents, cracks and shell inclusions could be brought for construction.

There are several types of blocks. Slim rectangular blocks were called *lieshiad'*. They were used in construction of walls and pillars, and also column or arching reinforcement in a determined order. Wall stone blocks were also used for wall and fundament construction. Facing blocks were used in building walls and facade facing. Coffins, grave-stones and memorials were also produced by local stone carvers (Fig. 4, Fig. 5).

Myachkovo limestone layer has a very useful property of its softness. It preserves this feature in very specific conditions: excess moisture of about 98% and thermal regime of about 8°C. In such conditions shaping of limestone was easier and it could be used not only as construction material. Architectural decorations and even statues were made of Myachkovo limestone.

Lime was also an important product of mining. Sometimes all the mined rocks, including waste materials, were lifted to the surface to be calcinated in special kilns. The produced lime was used as cement (Fig. 6).

At the end of the 19th - beginning of the 20th century



Fig. 4: the basement of Varvarskaya tower (15th century). Fig. 4: il piano seminterrato della torre di Varvarskaya (XV secolo).

several big lime and cement manufactures were founded. One of them was owned by "Martyanov & Ko" tradehouse which mined limestone in Domodedovo district near Nikitskoe village. Now this mine is known as Nikity, one of the most famous and longest quarry systems near Moscow.

The production haulage to the surface was performed in various ways. Beam galleries running out from the main one were made wide enough for a cart to run. A cart could be pulled by either a small horse which was mentioned in various sources or workers themselves. Also such thing as a *volokoosha* could be used for stone transporting. It was a low and wide cart without wheels



Fig. 5: limestone cemetery. Fig. 5: cimitero di calcare.



Fig. 6: limestone kiln. Fig. 6: fornace per calcare.

but sometimes with sledges. Volokooshas could slide on clav.

Limestone proceeding had several stages. Primary shaping was performed near the production place to immediately sort out defective blocks not suitable for construction. A primary shaping tool cold be an adze. It is an impact tool used to make a flat plane. It is also a professional tool as its strike must be very accurate and rather strong to dent the roughness. Droves were also used to make flat planes but were slower and safer. Nowadays we can find unfinished blocks in galleries and quarries wall backfilling. These are the defective ones due to production reason: with dents, cracks or shell inclusions. Such blocks are important research material.

Boot stone is limestone rubble or small unshaped blocks which are waste of limestone mining. Usually boot was not transferred to the surface and went to floor and wall backfilling. This process formed the common Moscow region quarries topology. According to this we can see the layer height only in working faces. The height and width of the galleries was made minimal to allow workers walk through and for production transporting. Studying of floor stratigraphy shows that floor backfilling was made in several stages. Archaeological research in the Pobeda quarry (a part of the Yubileynaya quarry system) gives an opportunity to describe the technological processes. Firstly the whole best quality layer was worked out vertically and horizontally from the floor level to the roofing. In some places workers left some pillars to hold up the roof. Then the floor roughness was backfilled with rubble and waste materials. It was graded into a plain floor for the carts and volokooshas to be able to run. Some rubble is supposed to be placed beneath the broken out block in the face floors to protect the falling blocks from shocks. When the face line went far from the entrance, the main volume between the pillars was backfilled up to the roof. Only passageways for workers and transport

were set in the backfilling massif.

Later the backfilling could be removed from some parts of some quarries for limestone calcining.

Splinters were often used for lighting in quarries. According to multiple finds of burned out or spare splinters we know that they were settled into convenient cracks without any special stands. Burned out and humid splinters were not removed from the quarry. Their coal helped in floor stratigraphy survey. Traces created by splinters cleaning looking like chaotic hatching can be found on the quarry walls. Workers also used charcoal pieces of burnt splinters to write on walls and to count the produced material. Their simple graffiti on the walls and pillars are still visible today. By the end of 19th – beginning of 20th centuries oil lamps started to be used for lighting (Fig. 7).

In winter limestone was transported in sledge carts to construction sites and markets. In summer it was ferried in special vessels known as *shitiki* from the low reach of the Pakhra, down the Moskva to its upper reaches, then it was transported to the Klyazma with horsepower and then ferried to correct places. Other rivers were also used for limestone transporting (Garin, 2004).

Archaeological evidences

There have been no serious archaeological surveys conducted in the limestone quarries of Moscow region. Most finds feature pick up material. They are rather rare. Mainly they are tools, nails, household items, parts of leather clothes, footwear, pottery, more rarely jewelry and decorative items (pectoral crosses, buttons) (Fig. 8).

Specially inclined horse nails are rather frequent finds. It confirms that small horses were used in quarries. Sometimes items non-specific for quarries (as scissors and pocket knives) can be found in the galleries. The finds of large leather pieces enveloping timber supports are also very interesting. Perhaps it was made to protect timber of the aggressive environment or to make timber installation easier or more stable.

Pottery in most cases features simple peasant vessels made of local clay. These are stove pots, water jars, dishes. Cooked domestic animal bones found near the



Fig. 7: graffiti in the Yubileynaya quarry system. Fig. 7: graffiti nelle cave di Yubileynaya.



Fig. 8: archaeological finds in the Pobeda quarry (a part of the Yubileynaya quarry system).

Fig. 8: ritrovamenti archeologici nella cava di Pobeda (parte del sistema caveale di Yubileynaya).

vessels show that miners worked underground the whole day without going to the surface to have a meal. Glass bottles were also found several times (Fig. 9). Strange rough shaped limestone circles (about 30 cm diameter) with a drilled hole in their centers are found rather frequently. Some researchers suppose that they were the parts of splinter stands, but multiple splinters finds without such devices do not confirm this theory. These stone circles have never been found at the surface as a part of some building or anywhere in use. Thus they could be supposedly involved in limestone production process. The mystery of the stone circles is still uncovered.

Caving in Moscow region

Several Moscow region quarry systems (mainly Syanovskaya, Kamkinskaya, Nikitskaya, Devyatovskaya and Volodarka) have been visited by irregular uncontrolled tourist groups since 1960s or even earlier. This process formed a special subculture of spelestologists visiting quarries regularly, mostly in winter. Such subcultures are specific for each quarry with its own legends, rules, taboo, folklore and traditions. The Soviet/Russian caving specific is staying underground for a long (at least 2 days) time with maximum comfort, so there is a tradition of camping place construction (grots) in some quarries (Gusakov, 1999). The original topology of many Moscow region quarries was changed with such construction. The Syanovskaya quarry system is the most changed one by cavers. And now it is not only an object of mining history but an important Soviet/Russian tourist object. Nowadays quarry caving is not controlled in Moscow region. There were several attempts of making an excursion object based on a limestone quarry but the quarry caving society resists against such attempts, anyway no such attempt had ever succeeded in Moscow region for various reasons.

Domodedovo town district most important limestone quarries description.

The Syanovskaya quarry system (Fig. 10)

The Syanovskaya quarry system is situated on the high left bank of the Pakhra river near Novlenskoe village. In Soviet period its several entrances were available until 1969. The system was visited by first Soviet cavers and was described by I. Stelletsky who mistakenly supposed it to be an ancient people settlement (Stelletsky, 1930). The modern entrance known as Koshachy laz ("the Cat's hole") was opened in 1988 from a collapsed depression. This quarry system is the longest one and has the highest roofing in Moscow region, reaching 4 meters in some faces; the total system length is 18850 meters. The entire system consists of several interconnected subsystems.

Three periods of mining can be distinguished in Syanovskaya. The earliest ones are the workings next to the ancient entrances. They mostly have irregular structure with pillars and a complicated labyrinth of passages. More recent workings have a more strict tree pattern (herring-bone) topology and are situated in far parts of the system. The newest part of Syanovskaya is the left one. It is a standalone quarry connected to the main volume.

The main quarry production were *tovarny* limestone blocks. Backfilling was left underground during that period of working. Later (late 19th - early 20th centuries) wall and floor backfilling were partly dismantled and removed from the system. Huge pillared halls with the largest area appeared as a result of this process (Fig. 11).

Limestone mining in this region has been mentioned



Fig. 9: limestone circles. *Fig. 9: ruote calcaree.*

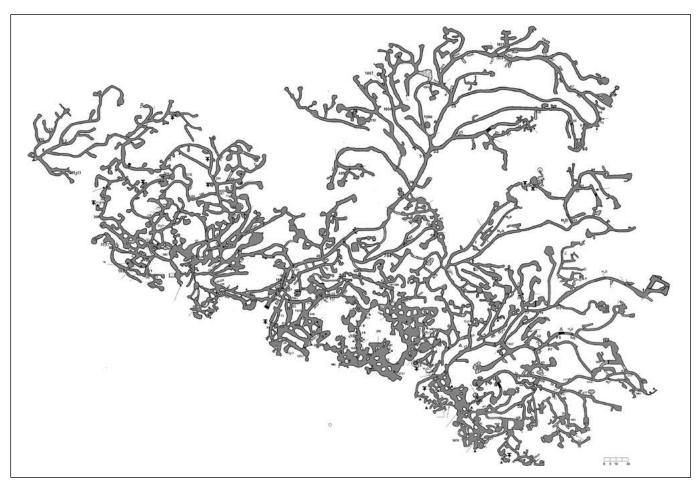


Fig. 10: the Syanovskaya quarry system. Fig. 10: il sistema caveale di Syanovskaya.

in various sources since the mid-18th century, but the main mining period of the Syanovskaya quarry system is the last half of the 18th century. Up to 50 miners worked here at that time according to archive sources. As stated above Syanovskaya is the most popular Moscow region quarry system among cavers. Up to several hundreds of people can stay here simultaneously in winter period. Musical concerts, cultural and housekeeping events take place in Syanovskaya. Documentary movies and TV-shows have been filmed about this quarry. Syanovskaya has become a sport or scientific career start for many Russian cavers and *spelestologists*. Attempts of making an excursion object with safe passages are also regularly made in Syanovskaya but still they had no success.

The Pionerskaya quarry with the total length of 770 meters is about 1 km downstream from Syanovskaya. The quarry has a radial gallery structure. The entrance of this quarry was mothballed by backfilling. Topology characteristic indicates that it is a typical quarry of the end of 19th century. The Pionerskaya entrance is closed nowadays. Archive sources analysis lets us suppose another large quarry system between Syanovskaya and Pionerskaya but such system is still not discovered (Sokhin, 2000).

The Kamkinskaya (Kiseli) quarry system (Fig. 12) The Kamkinskaya quarry system is situated in the village of Kamkino on the right bank of the Pakhra river.

It is about 13730 meters long. Ten its open entrances were known in the early 1930s, but only two of them are open nowadays. The main modern entrance was arranged in 1978. We do not know the exact date when limestone mining started here, but according to the system topology the main cavity volume was excavated in the second half of the 19th century. However, the system includes more ancient parts.

The entire Kamkinskaya quarry system consists of five subsystems (the Old system (Starukha), the New system, the Newest system, the Hell and the New Year system). They are different for used mining methods and determined age. This influenced the system topology. The eastern part has a tree pattern typical for the end of the XIX century (gallery-beam method). The western part is a combination of pillared halls created as a result of rubble remove for lime production purposes in later times.

The Kamkinskaya quarry system was one of the most popular ones among Moscow cavers in 1970s-80s. Nowadays it is not so often visited because its galleries are low and dirty and the Syanovskaya quarry situated nearby is much easier to visit.

The Nikity (Martyanov's) quarry system (Fig. 13) The Nikity quarry was discovered by Historian Spelestologists Group (GKS) in 1961. Its several different entrances were opened in different times later (now there is only one entrance open). Nikity is the



Fig. 11: the Syanovskaya quarry system. Fig. 11: il sistema caveale di Syanovskaya.

newest quarry from all of known limestone workings near Moscow. It had been operating since the end of the 19th century (but not earlier than 1870) till 1913 when the Rozhayka river waters flooded the quarry. It is known from archive sources that the right for limestone production in this place was bought by a well-known Moscow restaurateur, P. N. Martyanov. In the summer of 1900 "Martyanov & K" tradehouse representatives got the right for cement plant opening neartherailwaystation(Garin, 2004). In 1908 Martyanov signed a limestone supply contract with Domodedovo cement plant. He planned to start his business in grand style, but the land was owned by the peasants from Nikitskoye village. They did not want the forests on the banks of the Rozhayka river to be damaged and did not allow open-pit method limestone excavations. According to this Martyanov had to excavate the stone using underground quarries (Sokolova, 1957). The Nikity quarry topology is not typical for Moscow region. The mining was performed using the most modern Western technologies, particularly blasting method. Explosives crates were found in the quarry. Most of the system was driven using transversal and diamond patterns. Limestone was mainly mined as rubble and was supplied to the cement plant, so there is no wall backfilling specific for Moscow region quarries in this system. The produced limestone was completely removed to the surface and roof support was made of U- and T- shaped timber. Evidence indicates that limestone was mined here using foreign-made tools (Germany, Poland). Kerosene and oil lamps were used for lighting. To provide their stable burning a "ventilation shaft" was arranged (Sokolova, 1957). In later times a part of the quarry system was destroyed with an open pit.

According to the selected excavation method and the rock environment conditions the quarry system has been heavily damaged by collapses. The Nikity quarry system is one of the most dangerous ones for visitors among Moscow region quarries. According to the classification scheme adopted in speleology it was the only one to be assigned 2-A category. The total length of the surveyed part of Nikity is 15175 meters.

Several mine working fragments of up to 70 meters long are also known in direct vicinity from Nikity. Speaking about caving in Nikity it should be mentioned that during the latest period a strong and specific *spelestological* society appeared there. That society strongly influenced Soviet/Russian *spelestological* traditions and folklore. Nearly most of modern cavers' folklore has come from Nikity.

Douginskaya, Yubileynaya, Mesherinskaya (Fig. 14)

Another large mining region is the area of Dougino, Mesherino and Churilkovo villages. Three big and many small quarries and quarry systems of different character and date of creation are situated here, together with open pits. The largest one is the Churilkovo pit rounded by small underground fragments. Such open-

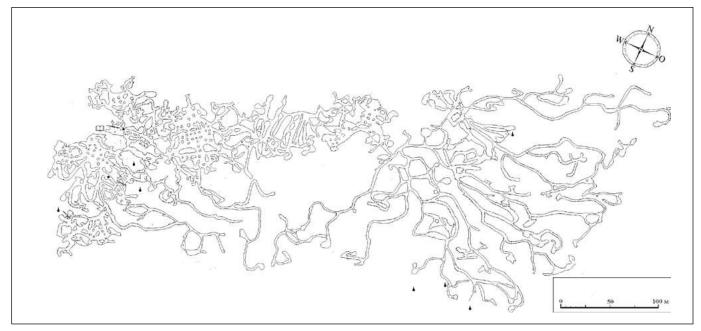


Fig. 12: the Kamkinskaya quarry system (mapped by A. Makarenkov, A. Vyatchin). Fig. 12: il sistema caveale di Kamkinskaya (rilievo A. Makarenkov, A. Vyatchin).

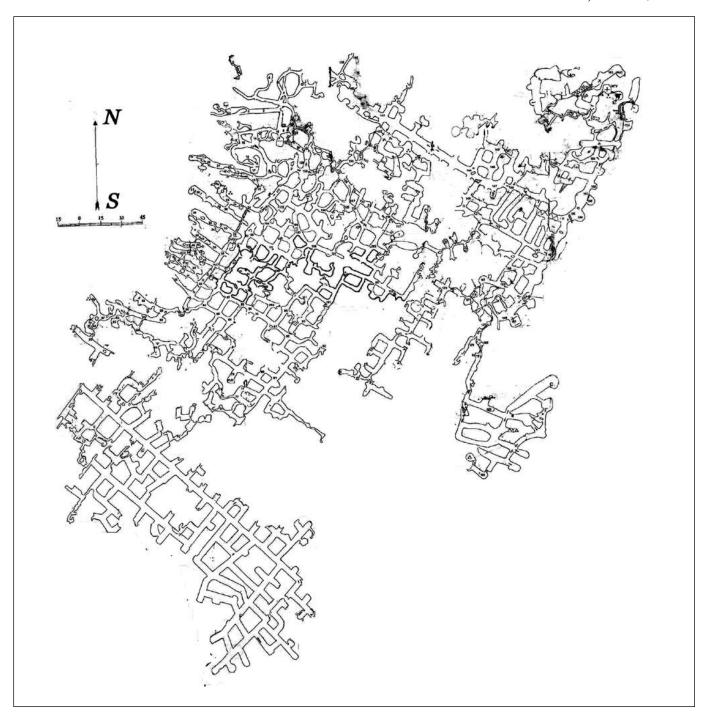


Fig. 13: the Nikity quarry system (mapped by G. Zyryanov). Fig. 13: il sistema caveale di Nikity (rilievo G. Zyryanov).

pit workings supplied cement production where the stone quality was not important and underground quarries were not required. The whole limestone layer for ancient mines was worked out. We can study such phaenomena in Churilkovo, Pakhrino, Vyalkovo and other open-pit quarries.

Douginskaya, Yubileynaya and Mesherinskaya quarry systems are the longest ones in the subregion, all of them are situated on the left bank of the Pakhra river. Their total length is more than 15 km. They were discovered, mapped out and surveyed by the *spelestological* research group «the Bat» (Fig. 15).

The systems have similar topology. Several their parts seem to be mined at the same time. The most ancient parts of the systems are the pillared halls situated near the river bank, driven not far into the rock massif. The volume was worked out with halls where some pillars supported the roofing. Later some space was backfilled as the mine working length enlarged and limestone production waste materials needed to be utilized. We are not exactly sure in what time these quarries appeared. Several finds in the oldest parts of these systems date by $16-17^{\rm th}$ century. Our researches are still running on.

The next stage of local mining features long galleries running to hundreds of meters from the bank. Beam galleries ran out from the main ones. Most of the volume was also backfilled. Limestone transporting cart traces can be found on the floor.

The quarry systems age is determined as a middle or

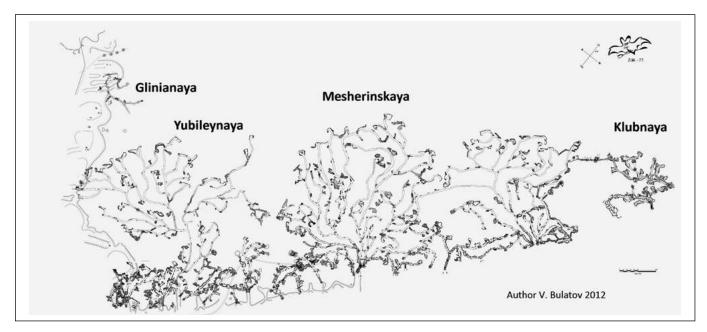


Fig. 14: the Glinyanaya, Yubileynaya, Mesherinskaya and Klubnaya quarry systems (mapped by V. Bulatov). Fig. 14: i sistemi caveali di Glinyanaya, Yubileynaya, Mesherinskaya e Klubnaya (rilievo V. Bulatov).

second part of the $19^{\rm th}$ century. We can see the graffiti on the walls: 1848, 1874 and other dates. Several mentions of limestone mining in these lands can also be found in archive documents.

Today Douginskaya quarry system is closed for visitors. It was decided to be saved for future surveyors as a classic example of the $18\text{-}19^{\text{th}}$ centuries mine working in a virgin state.

Nowadays only a part of the Mesherinskaya quarry system lies in Domodedovo district lands. Yubileynaya and Douginskaya quarries are mostly located in Leninsky district but in the past these territories were a part of Domodedovo lands.

There are also several small and short mine workings in Domodedovo district. A full list of known quarries of these territories is presented in Table 1.

Quarries of Domodedovo district See Table 1



Fig. 15: Glinianaya, Yubileinaya, Mescherinskaya and Klubnaya quarry systems.

Fig. 15: sistemi caveali di Glinianaya, Yubileinaya, Mescherinskaya e Klubnaya.

Designation	Total length	Location	Estimated age
Quarries	n/a	Domodedovo	n/a
Quarries	n/a	near Gorky Leninskiye	n/a
Novosyanovskaya	50	near Staroe Syanovo and Novlenskoye	n/a
Syanovskaya (Syany)	18850	near Staroe Syanovo and Novlenskoye	XVII-XX
Pionerskaya (Novlenskaya)	770	near Staroe Syanovo and Novlenskoye	XVII-XIX
Ryabushkinskaya-1 (Novlenskie Vyselki-1; Kormakovskaya-1)	6	near Novlenskoe, downstream of Ryabushkinsky ravine	n/a
Ryabushkinskaya-2 (Novlenskie Vyselki-2; Kormakovskaya-2)	7,7	near Novlenskoe, downstream of Ryabushkinsky ravine	n/a
Ryabushkinskaya-3 (Novlenskie Vyselki-3; Kormakovskaya-3)	32	near Novlenskoe, downstream of Ryabushkinsky ravine	n/a

Table 1: quarries of Domodedovo district - continued on next page.

Tabella 1: cave del distretto di Domodedovo - continua alla pagina successiva.

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Ryabushkinskaya-4 (Novlenskie Vyselki-4; Kormakovskaya-4)	n/a	near Novlenskoe, downstream of Ryabushkinsky ravine	n/a
Kiselikhinskaya	n/a	Kiselikha	n/a
Kamkinskaya (Kiseli)	13730	Kamkino	XIX-XX
Kamkinskaya-2	n/a	Kamkino	n/a
Glinyanaya	140	near Mesherinsky state farm and Churilkovo	n/a
KGB	6	near Mesherinsky state farm and Churilkovo	XIX
Yubileynaya	4015	near Mesherinsky state farm and Churilkovo	XIX
Mesherinskaya (Yu-3)	5810	near Mesherinsky state farm and Churilkovo	XIX
Churilkovskaya-3	821	near Mesherinsky state farm and Churilkovo	XVIII
Churilkovskaya-4	10	near Mesherinsky state farm and Churilkovo	n/a
Churilkovskaya-2 (Yamskaya-2)	24	near Mesherinsky state farm and Churilkovo	XVIII
Churilkovskaya-1 (Yamskaya-1)	40	near Mesherinsky state farm and Churilkovo	XVIII
Churilkovskaya-5 (Mayskaya)	230	near Mesherinsky state farm and Churilkovo	n/a
Churilkovskaya-6(Vosmimetrovaya)	8	near Mesherinsky state farm and Churilkovo	n/a
Quarries	n/a	near Krasino, left side of Zheryebyatyevsky ravine	XIX
Zheryebyatyevskaya	2000	near Krasino, right side of Zheryebyatyevsky ravine	XIX
Lokhmataya (Verkhnekotlyakovskaya-4)	15	Kotlyakovo and Kamkino, upstream of Vyalkovsky ravine	n/a
Morra (Verkhnekotlyakovskaya-3)	24	Kotlyakovo and Kamkino, upstream of Vyalkovsky ravine	XIX
Medovaya (Verkhnekotlyakovskaya-5)	10	Kotlyakovo and Kamkino, upstream of Vyalkovsky ravine	XIX
Ezhinaya (Verkhnekotlyakovskaya-2)	15	Kotlyakovo and Kamkino, upstream of Vyalkovsky ravine	XIX
Dachnaya (Verkhnekotlyakovskaya-1)	10	Kotlyakovo and Kamkino, upstream of Vyalkovsky ravine	XIX
Vyalkovskaya-1	193	Kotlyakovo and Vyalkovo, downstream of Vyalkovsky ravine	XX
Vyalkovskaya-1a	10	Kotlyakovo and Vyalkovo, downstream of Vyalkovsky ravine	XX
Vyalkovskaya-2	5	Kotlyakovo and Vyalkovo, downstream of Vyalkovsky ravine	n/a
Kotlyakovo-1	140	Kotlyakovo and Vyalkovo, downstream of Vyalkovsky ravine	XX
Kotlyakovo-2	325	Kotlyakovo and Vyalkovo, downstream of Vyalkovsky ravine	XX
Kotlyakovo-3	3	Kotlyakovo and Vyalkovo, downstream of Vyalkovsky ravine	n/a
Kotlyakovo-4	n/a	Kotlyakovo and Vyalkovo, downstream of Vyalkovsky ravine	n/a
Kotlyakovo-5(Shmelinaya, Dikaya)	1200	Kotlyakovo and Vyalkovo, downstream of Vyalkovsky ravine	n/a
Quarries	n/a	Kolychyovo	XVII
Quarries	n/a	Kolychyovo	XX
Quarries	n/a	Near Lukino, upstream of the Iskhodka river	XX
A quarry or a <i>raznos</i>	n/a	Near Kupriyanikha, downstream of the Iskhodka river	XX
Quarries	n/a	opposite to Kupriyanikha	n/a

Table 1: quarries of Domodedovo district - continued from previous page.

Tabella 1: cave del distretto di Domodedovo - continua dalla pagina precedente.

Redkino-1	5	near Redkino	n/a
Redkino-2	5	near Redkino	n/a
Redkino-3	30	near Redkino	n/a
Nizhnebityagovskaya	3	to the north of Bityagovo	XIX
Izyuminka-2 (Nikity depression)	n/a	upstream of Nikitskoye, near Beryozka camp (partialy destroyed)	n/a
Izyuminka-1	70	upstream of Nikitskoye, near Beryozka camp (partialy destroyed)	n/a
Zvyozdochka	n/a	near Nikitskoye	n/a
Nikitskaya-2 (Sineglazka)	10	near Nikitskoye	XIX-XX
Big Nikitskaya (Nikity, Martyanov's quarry)	15175	near Nikitskoye	XIX-XX
Lisiy Laz (Krysiny Laz)	70,8	near Nikitskoye	XIX-XX
Nikitsky lower grot	7	near Nikitskoye	XIX-XX
Eldorado	30	near Nikitskoye	XIX-XX
Lagoona	22	Nikitskoye	XX
Quarries	n/a	near Domodedovo (Yolochki microdistrict)	n/a
Quarries	n/a	near Barybino	n/a
Quarries	n/a	upstream of Korochyarovo	XIX
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Table 1: quarries of Domodedovo district - continued from previous page.

Tabella 1: cave del distretto di Domodedovo - continua dalla pagina precedente.

Conclusion

Domodedovo district is very popular among Moscow cavers and *spelestologists*. There are many places with rich limestone deposits where the stone was mined in the territories of Moscow region and the capital. However many underground objects are unavailable for research nowadays. Many of them were destroyed by city construction or open-pit quarries. The entrances to others were simply lost. Some of the quarries are known and opened but visiting is illegal as they are located in the territories of the capital where such objects are strictly controlled.

Domodedovo district is still free for research. This makes it an interesting and significant site. Only a small part of its mine workings have been found by now but research in this area still goes on. We hope that the future will bring us new discoveries.

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