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AN ANALYSIS OF A LANDSCAPE GARDEN SHAPED WITH MULTI LAYERED ARTTRUST NATURE AND MODERN PHYSICS SCIENCE: PETERHOF ROYAL GARDEN (RUSSIA)

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ABSTRACT

The historical gardens and parks of St. Petersburg, Russia, are valued as monuments of landscape architecture and components of the city's urban ecosystems. They date back to the early 18th century, when Peter the Great (1672-1725) oversaw the construction of the city (his iVenice of the Northî) on the marshy delta of the Neva River. After World War II, intensive restoration and reconstruction was begun in almost all of St. Petersburg's historical parks. One of these is the Peterhof Palace Gardens, a world class palace that provides a very worthwhile experience for anyone interested in architecture, art, or history. Peter I (the Great) founded Peterhof in 1709 as a country estate. After visiting the French court in 1717, he decided to make Peterhof into an imperial residence that would rival Versailles. The Baroque Grand Palace (1714–28) was designed by Domenico Trezzini and the palace's gardens by Alexandre Le Blond; Bartolomeo Rastrelli enlarged the structure in 1752. Peterhof subsequently became the most lavish and popular of the Russian royal summer residences (Britannica, 2019). In 1918 Peterhof became a museum although during World War II it was occupied by the German troops and suffered severe damage and was destroyed by fire. The reconstruction began almost immediately after the war and continues to this day. In the scope of this research; Besides the historical development of the palace gardens in Peterhof, Space organization, structures in palace gardens, water elements, characteristic elements and structures/overall planning will be discussed.

Keyword: Peterhof, Historical Park, Landscape design, Russia

1. INTRODUCTION

Peter the Great had during his European tour in 1697, where he studied subjects such as shipbuilding and artillery, been impressed by Europe, its royal houses, culture, technology, science and structure of administration and society. According to Hosking (2011); he wanted to be a part of Europe and soon saw the importance of having a connection with the Baltic Sea and thereby getting a possibility to have naval and diplomatic connections with Europe to achieve his goal. After capturing a small Swedish fort on the east coast of the Baltic Sea he decided to build a new city there, a new capital of Russia with the task of making this connection possible. He named the new capital Saint Petersburg and built it according to the latest European architectural fashion, soon the work with his great palace Peterhof began (Erikson, 2012).

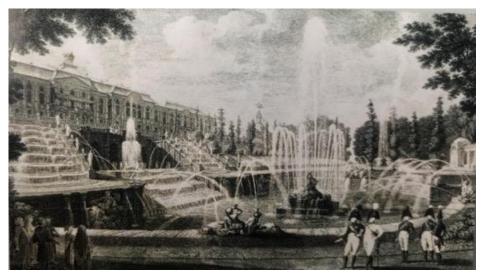
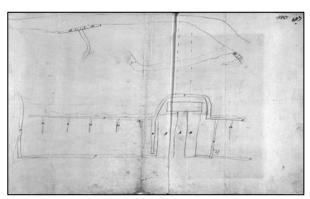


Figure 1. Петергоф Нижний Сад / Peterhof Lower Garden (Белоусов, 2016)

2. PETERHOF PALACE GARDENS IN THE HISTORICAL PROCESS

The Peterhof Palace was built in the early 18th century by Tsar Peter I (the Great) to rival France's Versailles. Situated 29 km from St Petersburg the location was ideal as it enabled Peter ease of access to Europe from the Kronstadt naval base - which was situated on an island off the coast - and also to St Petersburg, it was also to provide a suitable place to enable the provision of Kronstadt. The first building on the site was started in 1714; this was the Monplaisir Palace, which was to become Peter's summer palace. Peter played a major part in the design of Monplaisir and the other initial buildings and fountains. Constructed in grounds that cover more than six hundred hectares it was eventually to contain thirty palaces and pavilions. To facilitate construction a grand canal was dug between the main palace and the sea in order that building materials could be transported easily to the site by water from Western Europe in order to provide the thousands of workers. Peter wished to complete the construction in a short period of time and the main palace was completed in 1721. On August 14, 1723, Peterhof officially opened and was to become one of the favourite residences of the tsars, several of whom were to add to it over the years (Белоусов, 2016).

For the Monplaisir Garden, Peter came up with an extremely clear and precise plan: with two paths intersecting in the center, the garden is divided into four identical rectangular flower gardens. A high powerful water cannon at the intersection of alleys and fountains "closhes" (from the French cloche bell) with gilded statues in flower beds should have become the decoration of the garden. Peter's plan was embodied by architect N. Michetti in 1721-1723. In 1817, the lead sculptures were replaced with bronze cast from the models of I. P. Martos from popular classical originals (URL1, 2019). Peter the Great was developed all the basic planning solutions, made sketches-projects of palace complexes and fountain structures. The design of the fountain decoration of the Lo wer Garden designed by Peter the Great was completed in the 1730s by the architects M. G. Zemtsov, I. F. Blank, I. P. Davydov (Figure 2) (Белоусов, 2016).



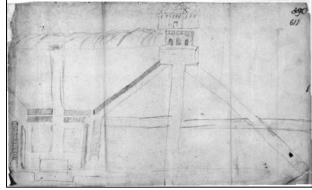


Figure 2. Hand drawings made by Peter I-1712- 1718 (Белоусов, 2016)

The Grand Palace was originally of similar size to the other buildings and was known simply as the Upper Palace. It was built between 1714 and 1721. The Palace was significantly altered and expanded between 1745 - 55 by Peters daughter the Empress Elizabeth, to the design of the Italian architect Francesco Bartolomeo Rastrelli, who added an additional floor, a new palace wing and a small domed church. The interior was remodelled in a baroque style, although Peter's study room was left intact. The decoration to the Grand cascade and the development of the complex also progressed under Elizabeth and during the reign of Catherine II (the Great).

The central ensemble of the Lower Garden is a representative part of the residence, which served as the entrance to the Sea Channel at Peter I. Today, as in the time of Peter the Great, the panorama of the Grand Palace and the grandiose fountain spectacle of the Grand Cascade, which opens from the channel side, causes constant admiration from the guests of Peterhof (Леонтьев, 2016).

In 1735, in honor of the 25th anniversary of the victory of the Russian army over the Swedes in the Battle of Poltava, a fountain was established with the sculptural group B.-K. Rastrelli "Samson tearing apart the jaws of a lion" in the Grand Cascade. In the same year, the garden part of the canal was decorated by the Alley of Fountains, which was based on fountain bowls moved from trellis niches in green bosquets on the sides of the canal to its very banks (Леонтьев, 1993).

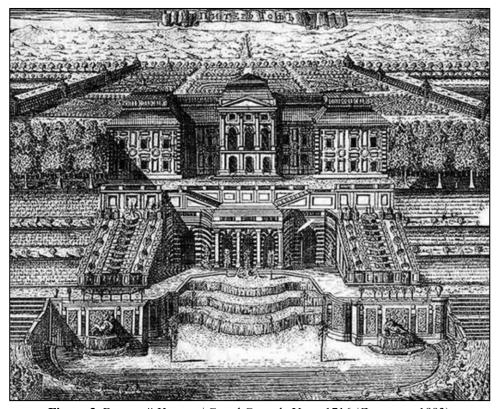


Figure 3. Большой Каскад / Grand Cascade Year: 1716 (Леонтьев, 1993)

Rebuilding and expanding the palace in 1745-1755, architect B.-F. Rastrel-Lee increased it by one floor and included in the new exterior composition two side hulls with gilded dome ends - Church and Stamp ("under the Coat of Arms"), connecting them to the main volume with low galleries with balustrades of open terraces on the second floor level. Compared with the restrained design of the middle part of the facade, kept in the tradition of Peter the Great's time, the architectural processing of the buildings is characterized by the diversity and pomp of the mature Baroque. The decoration of the Grand Cascade was updated in the early 1800s. The deformed lead statues and groups were replaced by bronze models of the largest Russian and European sculptors. A new group, "Samson, tearing the mouth of a lion," was performed by M. I. Kozlovsky. According to the projects of A.N. Voronikhin, bronze vases for new stone balustrades were made, the terraces were decorated with miniature cascades, and the partners in front of the Grand Cascade closed slender fountain colonnades, later named after their creator Voronikhinsky (Коренцвит, 2016).

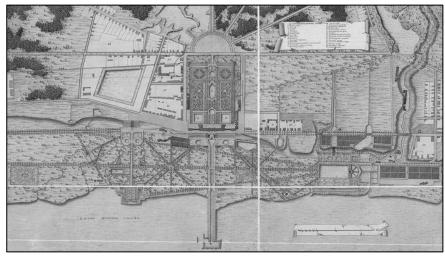


Figure 4. The layout plan prepared by architect Peter Neelov on August 6, 1797 (Коренцвит, 2016)

In 1853-1856, thanks to the joint creative efforts of the architect A. I. Shtakenshneider and the masters of the Peterhof cutting factory, the dilapidated fountains of Nizhny Park were replaced with new ones made of granite and marble, and elegant marble benches with fountains were installed in the corners of the flower gardens. "Nymph" and "Danaid", completed the formation of the central ensemble. In 1801, A. N. Voronikhin built a New (Lion) cascade near the Hermitage pavilion, which was rebuilt in half a century by A. I. Shtakenshneider. These two outstanding Russian architects played a leading role in improving the architectural and artistic appearance of the Lower Garden during the intensive construction of the years 1799–1806 and 1853–1857. Further work consisted mainly in the repair and renovation of architectural relics of the Peter epoch and did not make significant changes in the composition of the garden (C. H. Полторак, 2010). Yet, the Palace has been known for its numerous and different fountains. The greatest of these is the Grand Cascade, built in 1724, bearing a large cascade that starts at the foundation of the Great Palace and continues until a long canal, reaching the Gulf of Finland. These fountains run without using pumps. Natural springs located close by supply water and it accumulates in reservoirs of the Upper Gardens. Fountains in the Lower Gardens, including the Grand Cascade, operate by pressure that is created due to the elevation difference and not by means of pumps. A unique aqueduct of more than 4 km of length supplies the Samson Fountain, fed by water and pressure from a source located at a higher altitude (Hynynen et al. 2012).

In 1917 after the Russian revolution, Peterhof became a large educational center. During World War II, the German occupiers barbarously destroyed the palaces and the park. The reconstruction began from the first days of the liberation. And today, this nature and man-made masterpiece welcomes the guests, impressing and surprising them, just like before. In 1990, the architecture and park ensemble "Peterhof" was included in the world's list of intangible cultural heritage of UNESCO, and was recognized in 2008, as one of the seven wonders of Russia (Петергофский государственный музей-заповедник, 2019).



Figure 5. Grand Palace with a cascade in 1944 (Леонмьев, 2010)





Figure 6. Grand Palace with a cascade in 1947 (Леонмьев, 2010)

3. SETTLEMENT PLAN OF PALACE GARDENS

Peterhof Royal Garden is divided into two main parts, an upper- and a lower garden. The upper garden is situated on the south side of the palace and is strictly symmetrical and constructed along a main axis which continues on the other side of the palace to and through the lower garden. Along the axis in the upper garden there are three parterres and a basin placed on a row along it. Walking through the entrance gate the palace is the focal point of the open vista together with the sculptures placed along the main axis. According to Znamenov (1978, p. 15) the upper garden was intended as an imposing entrance for visitors arriving to Peterhof by land (Erikson, 2012).



1-Большой дворец <u>/</u> Grand Palace	16- Памятный знак в честь основания Петергофа / Memorial sign in honor of the foundation of Peterhof	30- Фонтан "Грибок" / Fountain "Fungus"
2-Большой каскад и план Большого каскада / Grand Cascade	17- Венера Медицейская / Medici Venus	31- Водяная дорога / Waterway
3- Фонтан "Самсон" / Samson Fountain	18- Павильон Эрмитаж / Hermitage pavilion	32- Фонтан "Пирамида" / Fountain "Pyramid"
4- Гроты / Grottoes	15- Афина Джустиниана / Athena Giustiniana	33- Римские фонтаны / Roman fountains
5- Фонтан "Чаша" итальянский / Fountain "Bowl" Italian	19- Каскад львиный / Lion cascade	34- Каскад "Шахматная гора" / Cascade "Chess Mountain"
6- Фонтан "Чаша" французский / Fountain "Bowl" French	20- Фонтан "Ева" / Fountain "Eve"	35- Фонтан "Оранжерейный" / Fountain "Orangery"
7- Фонтан "Собаки и утки" / Fountain "Dogs and Ducks"	21- Фонтан "Адам" / Fountain "Adam"	36- Церковный корпус / Church building
8- Фонтан "Мраморная скамейка" / Marble Bench Fountain	22- Музей "Екатерининский корпус" / Museum "Catherine Building"	37- Фонтаны квадратных прудов / Fountains of square ponds
9- Фонтан "Китовый" / Fountain ''Whale''	23- Музей "Монплезир" / Museum "Monplaisir"	38- Фонтаны квадратных прудов / Fountains of square ponds
10- Памятная скамья / Memorial bench	24- Музей "Банный корпус" / Museum "Bathhouse"	39- Особая кладовая / Special storage room
11- Каскад "Золотая гора" / Cascade "Golden Mountain"	25- Фонтаны "Шутихи" / Fountains "Crackers"	40- Фонтан "Дубовый" / Oak Fountain
12- Фонтаны "Менажерные" / Fountains ''Menager''	26- Музей "Вольер" / Museum "Aviary"	41- Статуи покровителей природы Бонацца / Statues of the patrons of the nature of Bonazza
13- Фонтаны "Клоши" / Fountains "Clogs"	27- Фонтан "Солнце" / Fountain "Sun"	42- Фонтан "Нептун"/ Fountain "Neptune"
14- Дворец Марли / Marly's Palace	28- Памятник Петру I / Monument to Peter I	43- Фонтан "Межеумный" / Fountain "Mezheumny"
15- Афина Джустиниана / Athena Giustiniana	29- Фонтан "Дубок" / Fountain "Dubok"	44- Главные ворота Верхнего парка / Main gate of the Upper Park

Figure 7. Карта Петергофа. План-схема Петергофского парка -Settlement plan of Peterhof (URL 3-2019)

Lower Garden

Table 1. Information of the Lower Garden (Петергофский государственный музей-заповедник, 2019)

Total area	102,5 hectares	
Date of Construction	1714 - 1723,	
Architects	J. Braunstein, J. B. Le Blond, N. Michetti, F. Rastrelli, A. N. Voronikhin, A. I. Stakenschneider.	
Gardening masters	L. Garnihfelt, A. Borisov, B. Fock, T. Timofeev	

Examples of the regular gardens were used to build the Lower Garden and it consists of all the characteristics of its French originals. Despite many decorative components have perished today, magnificent architectural harmony of the garden has been preserved in time. This garden was built by J.B Le Blond, who was a student of A. Le Nostre, the designer of the Versailles gardens. The Lower Garden is made of three connecting sections: central ("Grand"), western ("Marly") and eastern ("Monplaisir"). The two alley systems characterize the plan of the Lower Park that divides the fan from the Grand palace and the Marly palace. The plan was designed so that guests could see all garden decorations and details. Every alley ends at a palace or a fountain. Fundamental constructions are situated symmetrically in a regular park typically. The cascades are positioned on the hillsides- "The Great" (at the foundation of the Grand palace in the central section), "Chessboard Hill" (in the eastern section) and "Golden Hill" (in the western section). Paired fountains are located in front of each of them: "Bowl", "Roman" and "Menager". The parterre consists of only one of the four cascades - the "Lion Cascade". It is completed the latest due to its erection

time. The summary of the park's design as composed by Peter I is: there must be a special matching cascade in every palace and pavilion. The Garden is decorated by 150 fountains in a 112.5 hectare of area. The trick fountains include: the "Little Oak", the "Umbrella", "Little firs", the "Water road" and "Benches", the favorite fountains of children and adults (Каргапольцев, 2010).





Figure 8. Петергоф, Нижний парк / Peterhof, Lower garden (Photos were taken by the authors, 2017)

Grand Cascade

Table 2. Information of the Grande Cascade (Петергофский государственный музей-заповедник, 2019)

Date of Construction	1715 - 1724	
Architects	J. Braunstein, JB. Le Blond, N.Michetti, M.G. Zemtsov	
Hydraulic works:	P. Sualem, V. Tuvolkov, Barattini brothers;	
Sculptors:	BC. Rastrelli, F. Vassu, K. Osner	

The Grand cascade is the Peterhof ensemble's most fascinating fountain structure and one of the most magnificent creations in the world. The cascade has a simple and concise solution. The archways of the large grotto connect the two extensive seven-step staircases. The roomy area in front of it turns into the central three-level cascade and its water falls into the scoop like a silver veil, reaching the Sea canal. The large grotto has a terrace above as connected by the small grotto's facades. The marble balustrade decorates it with eight marble vases placed on it. A basket fountain is positioned on the lower terrace at the entrance to the large grotto. Outer ring of tufa spurts the inclined jets that are interweaved like basket twigs. Nine strong vertical spurts, resembling mythical crystal flower stems, rise from its interior. The water movement in the cascade starts with the streams at the two mascarons of Neptune and Vakh that are positioned on the walls of the small grotto. It goes on at the stairs and passes under the base of the cascade and then ends at the footsteps of the sculptures that symbolize the Russian rivers of Neva and Volkhov. The cascade owes its artistic look to the sculptural decoration, solving the main duty of the grand built and enhances the power of the Russian state and the Russian army's victory in the Northern war.





Figure 9. Петергоф, Большой каскад / Peterhof, Grand Cascade (Photos were taken by the authors, 2017)

The overall structure of the lower garden consists of a system of straight roads and three main long alleys. The middle alley is parallel to the coastline, perpendicular to the main axis and the longest alley of the

garden. It has two fountains placed on an equal distance from the main vista's channel. The two sculptural fountains are important points of view on the alley.







Figure 10. Use of Alley Designin Lower Garden (Photos were taken by the authors, 2017) **Upper Garden**

Table 3. Information of the Upper Garden (Петергофский государственный музей-заповедник, 2019)

Total area	15 hectares	
Date of Construction 1714 -1724 / 1754 -1760		
Architects JB. Le Blond, gardening master L. Garnihfelt / F.B. Rastrell		

The Upper Garden is positioned on the terrace in front of the Grand Peterhof Palace's southern façade and is regarded as a main entrance to the imperial residence. It is a distinctive, bright and roomy vestibule under the open sky. Its plan has been applied based on Peter I's drawings and it changed very little in time. The Upper Garden gained an extraordinarily great look in 1730. The vegetable beds were eliminated and the trellis pavilions and glided statues were positioned in the parterre and the fountains were placed in the pools. The garden was enlarged according to the project of F. B. Rastrelli in the middle of the 18th century due to the palace reconstruction and a fence, containing stone pillars and lattices of wooden spears, surrounded it on three of its sides (Павлова, 2010). Gates with great pylons and iron-shod doors decorated the main entrance from the side of the Peterhof road. The architecture of the Grand Palace connects the garden compositionally. There is a matching parterre, consisting of three pools with fountains, located on the central axis in the central section. The sides of the parterre have two square ponds and three symmetrically positioned shrubberies as circled with trimmed bushes. There are square, oblique and circle shrubs based on the scheme. Five fountains decorate the Upper Garden in the shrubs near the eastern pond since the times of Anna Ioanovna and there is a rosarium. Peter I's pharmacy garden was improved by the western one with tutsan, oregano, echinacea, lemon balm, mint and other medicinal herbs, planted on its soil beds. The Upper Garden is considered as a fascinating example of the regular type park structuring. Straight alleys with trimmed lindens and the berceau galleries weaved with greenery and green lawns and ball and cone shaped thujas are typical in its geometrical plan. Sculpture is the essential component in the regular parks. Neptune, positioned in the central pool, is the most gripping baroque sculptural group. It was built in Germany in the 1650's, captured by the emperor Pavel I, and witnessed many events in its lifetime.

The bronze statue of Appolo Belvedere decorates the small cascade on the south side of the pool. The marble sculptures of the god of gardens Vertumnus, the goddess of fertility Pomona, the god of the warm wind Zephyr and Flora, the goddess of spring lighten the parterre. These were made by Antonio Bonazza, the Italian sculptor of the 18th century. The Upper Garden turned out to be one of the best examples of regular garden restoration as a result of a complicated restoration that was carried out according to the historical documents in the 1860's. The Upper Garden is inviting with blooming fruit trees throughout the year or in lively colors of fall or like a mesmerizing crystal forest in winter and it is a lovely place for Peterhof residents and visitors. The entrance is free (Петергофский государственный музейзаповедник,, 2019).



Figure 11. Петергоф Верхний Сад / Peterhof Upper Garden (URL-2, 2019) Peterhof Garden's layout and structures

Table 1. Structural and Plantation Design Dharacteristics of Peterhof Royal Garden

Title	Details	Photo
Axis	One main north-south axis starts at the palace and makes up the central structure of an upper and a lower garden on the two major sides of the palace. The other main axis extends in the lower garden and passes through the north-south axis at perpendicularly.	
		Figure 12. Belous, 1979
Perspectives	An unceasing perspective lies from the palace to the Baltic Sea. Upper Garden's perspective concentrates on the palace. In the garden design, baroque effect has been created with the formation of radial and perspective.	Figure 13. Photos were taken by the authors,

		2017
Main Vista	The infinite vista that starts at the palace and reaches the Baltic Sea. The waterway enchants visitors like a tale that is born and spilled into eternity.	Figure 14. Photos were taken by the authors, 2017
Topography	Change of altitude from the upper towards the lower garden. The lower garden is flat and it confines the Baltic Sea.	Figure 15. URL-4, 2019
Parterres	There are pools with symmetrically positioned fountains along the main axis in the upper garden. The flowers were formed around the ponds, usually equipped with sculptures and fountains. In the central location, flower parters are designed.	Figure 16. Photos were taken by the authors, 2017
Fountains	There are many fountains of different shapes and forms throughout the garden. The main fountains on the main axis and the cascade generate marvel for the palace and main perspective. A natural water source is created by means of the favorable topography and this enables feeding of the entire waterworks.	Figure 17. Photos were taken by the authors, 2017
Sculptures	The Garden has many symmetrically positioned sculptures, which are generally used as critical perspectives. The sculptures were used as decorative objects in both gardens and pools.	Figure 17. Photos were taken by the authors,

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Plantation Design

The Lower Garden section is dominated by local species, whereas in the upper garden section, exotic species of different origins are used extensively.



Figure 21. Photos were taken by the authors, 2017

Landscape **Structures**

There are different shapes of limiters and details of living elements with environmental elements. Contrast and emphasis have been provided with the intensity of use of white color in landscape structures. It is seen that natural flooring elements such as natural stone and bricks are used in the



Figure 22. Photos were taken by the authors. 2017

4. CONCLUSION

Peterhof, located near the St.Petersburg, the new capital was founded by Emperor Peter I in the beginnings of 18th century. Peterhof is a landmark that marks the Russia's accomplishment of reaching to Baltic Sea while also being one of the most grandiose imperial summer residence located in Russia. A lot of its elements like Upper Garden, the Lower park, Grand Palace world's largest system of fountains and cascades and most of the sculptures there were built and/or located there in around 1720s. Peterhof has a special fountain system. Using no pump at all, it functions based on the principle of communicating reservoirs, which are driven by the hydraulic pressure caused by the difference in the water-supplying ponds' and the fountain's level.

Gardens in palaces all have some historic aspects and Peterhof Royal Gardens, sharing this quality have that outdoor-museum design in the most peculiar way with the help of flora, structural elements, esthetical value along with cultural flavor and particular location it has. Peterhof has founded on the Gulf of Finland with beautiful landscape and cascades, changing French heritage with a signifying Russian inflection. The Royal Garden of Peterhof has two symmetrical overlapping structures that is created by two main axes. The upper garden has parterres and bosques which are in symmetry with main axis and Vista. In Peterhof, the focal point on the palace itself is designated as an entryway. Stretching out over the Baltic Sea, while making a stretched-out appearance over the ocean for the park, and immense vista is located in the lower garden. In the garden design, the effects of naturalism flow, including the late Baroque current, are observed. In the context of the building and garden relationship, the emphasis is on the lean architecture on the facades of buildings and on the human impact on the garden. Especially the density of the natural species in the lower garden and the intense and shaped landscape in the upper garden can be interpreted as a ler challenge üst to nature. On the other hand, the use of natural resource values in garden design shows the effort of integration with nature.

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