Garden Design Principles and the Extensive Use of Water Elements in Villa d' Este, Tivoli, Italy

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Abstract
Villa d'Este in Tivoli is regarded as one of the most substantial examples of Renaissance culture and garden art owing to its palace and garden. Villa d'Este has always set a model and influenced the development of European gardens as being one of the first miracle gardens. Drains, tunnels and conduits diverted the Aniene waters in many points in Roman time both to supply water to villa `gardens and public palaces and to explode waterfalls to supply motive energy mills. Accordingly, Cardinal Ippolito II d'Este and Pirro Ligorio designed a project naturally to divert the Aniene waters and to bring them to Villa d'Este and to visualize the garden as a hill crossed by many underground tunnels and passages as it is in Tivoli's. In this study, the history, design, constructional characteristics and the layout scheme of Villa d'Este situated in Tivoli, as the garden of Italian Renaissance Period was analyzed. Having a significant cultural landscape value with regards to the usage of water, including the variety of water usage methods (fountain, grotto, cascade and pool), the water features within Villa d'Este garden will be examined in the studies; thus, explaining each and every water structure in detail.

Keywords: Villa d'Este, Tivoli, Fountain, Use of water

Introduction

The history of gardens is closely bound up with the history of garden theory. This connection is both interesting and problematic. Garden theories refer to both art and nature. In their spectrum a wealth of tensions unfolds between the contemplation of nature and art, tensions that are intended eventually to lead a garden design. In Italian Renaissance three principal types of garden theory can be distinguished. The first type largely considers and describes gardens from classical antiquity and the Middle Ages, without, however, producing new design ideas (Kluckert, 2000). The art of garden design of the Renaissance in Italy was as significant and varied as any art in the history of the world, and if it does not rank in general esteem as high as that painting, sculpture and architecture, this is only because it opportunities were less and it was more subject to decay. As it is living material nevertheless these gardens illustrate the principles of design probably more clearly than any of the other field of arts; for like painting they are pure abstraction and unnecessary to existence and like architecture they have a content into which one can penetrate and for while become a part. The Italian Renaissance garden is based on four essential elements namely geometry, the human figure, movement and the environment (Jellicoe, 2018).

The Italian Renaissance garden was a new style of garden which emerged in the late 15th Century at villas in Rome and Florence, inspired by classical ideals of order and beauty, and intended for the pleasure of the view of the garden and the landscape beyond for contemplation and for the enjoyment of the sights, sounds and smells of the garden itself. In the late Renaissance, the garden became larger, grander and more symmetrical and filled with fountains, statues, grottos, water elements and garden features designed to delight their owners and amuse and impress the inhabitant elements (Unesco Report, 2001). In the Italian Renaissance garden either nature and order planting and design, cannot be separated from each other. They are interlocked in the

compartments or squares forming the basic units, in trees planted in rows, in straight paths that cross at right angles and hedges limiting all plant partitions and axes. The designs in compartments used during the sixteenth century were composed for the most part of geometric figures, those in labyrinths were based on circles and squares, and spiral paths surmounted tree houses. A renaissance garden was mainly characterized by geometric garden design applications. However, since nature was understood in more than one-way, different kinds of estates corresponded with the two principle views of nature. Its inherent order was represented in the geometric garden; wild and untamed nature in the park. These two extremes were not mutually exclusive: one could contain the order or the whole have aspects of each. But as distinct entities they embody different attitudes toward nature, design, and antiquity (Lazzaro, 1990).

There is not sufficient evidence to characterize the design of fifteenth century garden and a development over the course of sixteenth century can only be hinted at, but the common features that persisted throughout much of the period in both modest and grand gardens can be outlined. The most fundamental ordering elements of both early and late gardens were the compartment, as the basic unit, and geometric figures. These forms were added in the sixteenth century specifically given authority by antiquity, such as the hippodrome and theater. All these elements subdivided the whole garden into units or separate parts which were defined by hedges and shelters. The subdivision of the whole into regular units remained an essential design principle of gardens until the late sixteenth century, but the organization and linking the units changed during that century. Another defining aspect of Renaissance gardens from early to late is a reference to antiquity in many different ways, among them interest in the natural World, topiary, tree houses, labyrinths, grottoes and automata, also sculptures like Roman or ancient time period, and classical architectural forms. These interests climaxed in the grand gardens of sixteenth century in central Italy with the emulation of the terraced architectural complexes of the ancient's culture. The monumental architecture and sculpture, massive alteration of the land, and abundant supply of fresh water characterizing these gardens have few parallels in more humble ones, but other ephemeral features - partitions outlined by hedges, trees in row, shelters and topiary – were common to both. In garden forms the fifteenth through the sixteenth century two primary sets of concerns can be distinguished: units, partitions, separate parts can be named, measured, and counted, enclosed and hidden spaces and sequential experiences on the one hand; and on the other hand linking of parts, axial organization, directional impulses, vistas and unity (Lazzaro, 1990).

History of Villa d'Este

The Villa d'Este, located in the town of Tivoli, twenty miles outside of Rome, was commissioned by the Cardinal Ippolito II d'Este when he became Governor in 1550. The town built on a rock jutting out the lower slpoes of the sabine hills overlooking the Roman countryside is surrounded by wide loop made by the Aniene River which here narrows into a deep and broken gorge near Villa d'Este (Unesco, 2001). Ippolito died before construction was completed, however, leaving the work to be continued under various inheritors. The Italian government eventually bought the estate in 1920 (Gargaillo,2016). Villa d'Este was the masterprice of the *Giadino all'italiana,* created by Pirro Ligorio for Cardinal Ippolito d'Este, represented something absolutely new in the panorama of the 16th century villas (Barisi & Catalano, 2004). The cardinal also purchased several plots of land below the monastery, to be incorporated into the grounds (Barisi & Catalano, 2004). However, the construction would not begin until 1560, starting with an aqueduct to supply both the town of Tivoli and the Villa with water. This source went to a reservoir under the monastery, from which it supplied fountains with gravity (Coffin, 2004).

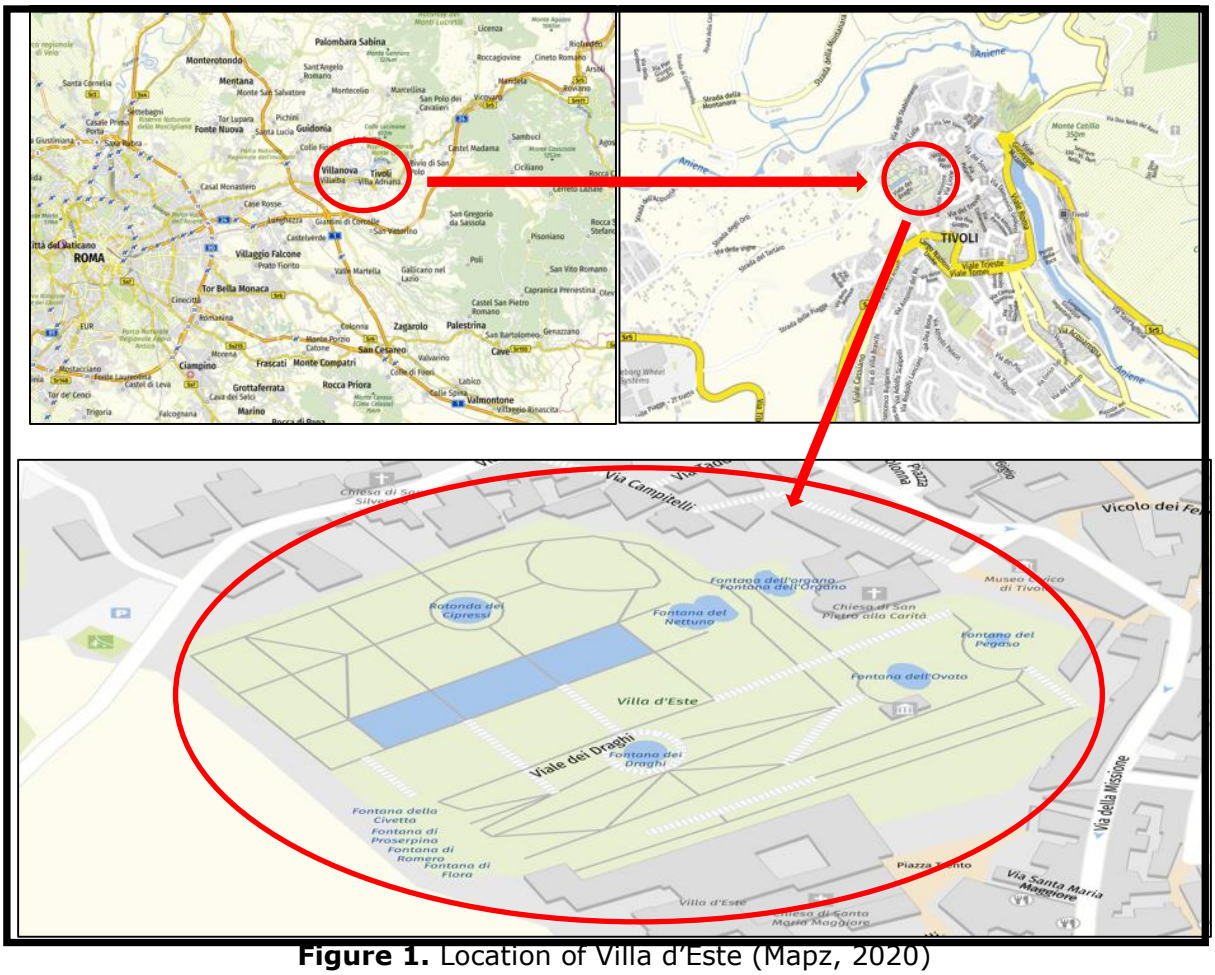


Figure 1. Location of Villa d'Este (Mapz, 2020)

In between the aqueducts being built a significant earth moving project was conducted to reshape the hill. Originally, the hill was not on axis with the monastery, but sloped from the east corner down to the west (Coffin, 2004). Massive amounts of earth were moved to create a smoother, more symmetric slope to the southwest. However, while main axis of the slope appears to be perpendicular to the front of the estate buildings, in reality it is slightly off. Rather, the axis aligns with the Tiburtine Sibyl temple that stands at the top of the Tivoli Falls, an element of classical mythology heavily featured in the iconography throughout the villa (Russell, 1997). 1566 was the start of the renovations made in the monastery and church, vegetation planting, and building of variety of fountains. Several specialists were gathered for the construction of complex features. Curzio Maccarone, for example, oversaw the erection of the Oval Fountain from 1566 to 1567, and the Fountain of Rome in 1567. The Fountain of Nature was constructed by the father-son duo Luc LeClerc and Claude Venard in 1568. Sculptors were assigned to make statues, in addition to the marble and artifacts collected by Ligorio at Hadrian's Villa, less than 4 km from the site. The finally completed feature was the Dragon Fountain, built rapidly for a visit from Pope Gregory XIII, with his family's coat of arms displaying a dragon (Coffin, 2004). The villa was essentially complete when d'Este died in December, 1572. A fishpond in the northeast corner and the Fountain of Neptune were among the few features never completed. Today, the head and bust of the Neptune statue meant to stand in the fountain instead sits behind a cascade of water added to the Fountain of Nature. Work by Ligorio on the villa stopped with the cardinal's death (Coffin, 2004). The villa was passed down to Ippolito's nephew, Cardinal Luigi d'Este, who finished some projects and maintained the overall villa. For years after Ippolito d'Este's death, the villa remained a center of culture, heavily trafficked by artists, the nobility, and royalty (Barisi & Catalano, 2004).

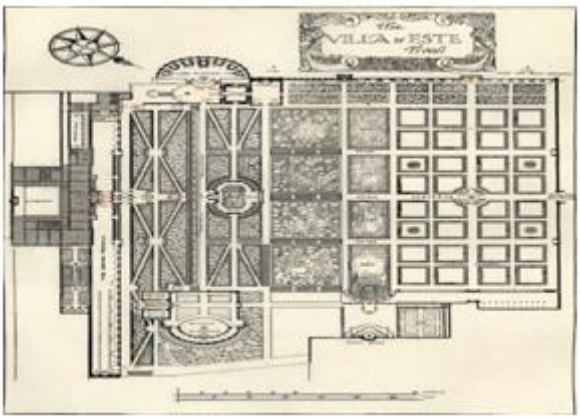


Figure 2. Plan of the Villa d'Este in 1573

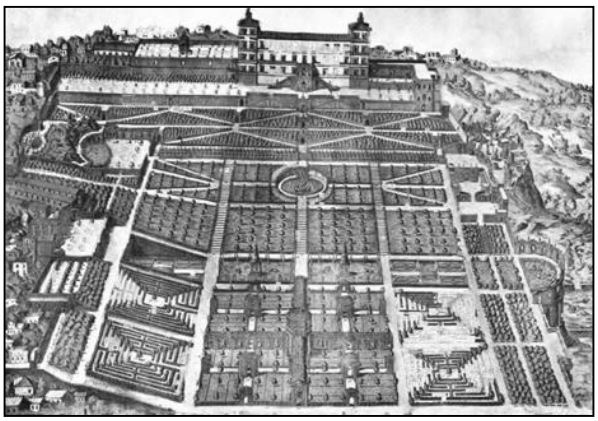


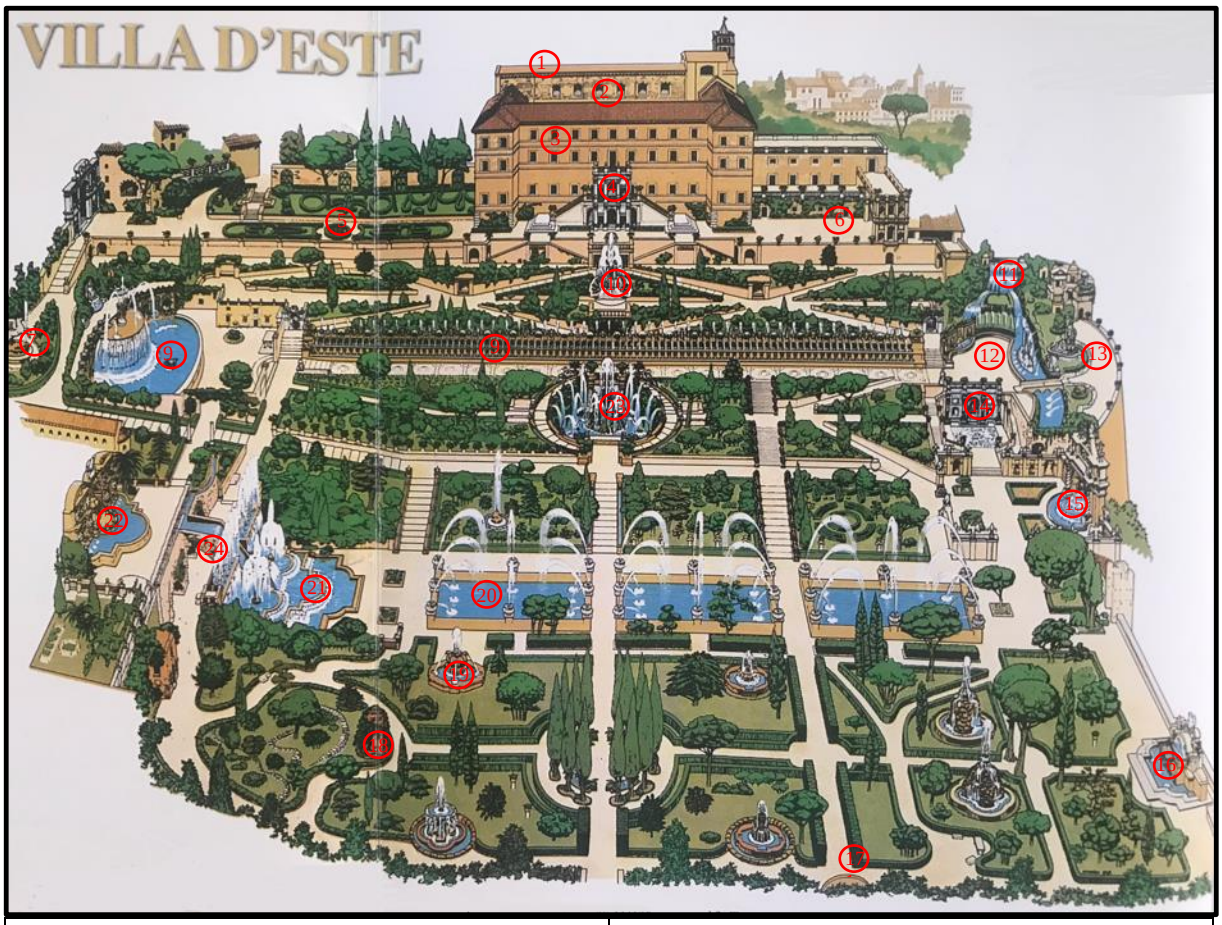
Figure 3. View of Villa d'Este in 1573 (Ashby, 1907)

Garden Design of Villa d'Este

The gardens of Villa d'Este consist of symbolism, and their structure, statues and decoration implies many stories, like most Renaissance gardens. Both Ippolito d'Este and Ligorio were fond of classical antiquity and mythology, and hence, the decoration and arrangement of the villa contained a major mark of this approches. It can be seen that images of Jupiter, Neptune, Hercules and Venus are distributed throughout the villa (Russell, 1997).

The plan of Villa d'Este complex consisting of the palace and adjoining garden is quadrangular, with irregular sides, and extendes of approximately 4.5 ha, 225 meters in depth (from the North-western boundary was to the Church of S. Maria Maggiore), 215 meters in width in the higher portion and 160 meters in the lower. The total difference in height from the entrance to the palace to the portal on Via del Colle is approximately 50 meters. On the south-eastern side, the villa adjoins the church of S. Maria Maggiore, built in the 19th century, whose right wall coincides with the rear side of the inner courtyard of the palace. On the south-western side, the garden is partly enclosed by the medieval city walls, still visible, although they were later included in the substructures that Pirro Ligorio had built in order to support the terraces. The perfectly straight north-western side adjoins medieval houses built along the ancient Via Tiburtina, today called Via del Colle, from which the narrow access way projects. The north-eastern perimeter, much more irregular, testifies to the difficulties encountered by Cardinal Ippolito II in purchasing lands, as the garden intrudes into the urban Campitelli district, and the apse of the church of S. Pietro alla Cariti, dating back to the 12th century, protrudes into the garden. The villa has reached to the present day its 16th century plan - with terraces and gentle slopes decreasing from south-east to north-west with a unique architectural style. The area, called Valle Gaudente, enclosed on the south-western side by the city walls,

included vineyards and vegetable gardens, with few dwellings located in the lowest part towards Porta Romana, and a heavily built urban area on the north-western side, towards the Campitelli district. However, there were two buildings that the Cardinal of Ferrara did not succeed in buying or having demolished, that is the churches of S. Maria Maggiore and S. Pietro. Their presence limited on the one side the size of the palace from one side and on the other affected the symmetry and regularity of the garden, whose lowest portion was to be much narrower as a consequence. Moreover, the south-western boundary was limited by the city wall causing a significant imbalance between the area covered by the palace and the overall complex, whose plan was never to equal to the regular pattern portrayed by Architect Etienne Duperac (Unecso Reoprt, 2001). The garden was splitted into three different sections based on the structure of the ground: following the first steep portion (of which depth is 30 meters with a height difference of 15 meters) comes a second gently slope (of which depth is 60 meters with a height difference of 15 meters), finishing with a third level section, with a depth of 85 meters. In the second and third sections, the geometrical pattern of the plan can be observed clearly based on a square module (30 by 30 meters), as splitted into regular squares by a number of straight perpendicular paths, yet not being clearly seen in the highest section due to being crossed by an array of diagonal walks (Barisi & Catalano, 2004).



1- Church of St. Mary Major	2- Courtyard with Fountain of Venus
3- The Palace	4- Stairs
5- The Terrace	6- Courtyard of Pallacorda
7- The Pegasus Fountain	8- The Ovato Fountain
9- The Hundred Fountains	10- The Fountain of Biccierone
11- The Tiber	12- The Island in the Tiber
13- The Capitoline She-Wolf	14- The Fountain of Proserpina
15- The Fountain of the Owl	16- The Fountain of Aridane
17- The Fountain of Nature	18- The Fountain of Prophet

19- The Fountain of the Eagle	20- The Fish Ponds
21- The Fountain of Neptune	22- The Fountain of Organ
23- The Fountain of Dragons	24- The Grottoes

Figure 4. Settlement Plan of Villa d' Este (Figure: Promotion brochure of Villa d'Este)

- **The Courtyard**

The courtyard which splendidly adapter for the sumptuous residence of Cardinal, is accessible through the entrance hall. As supported by doric pilasters, a Tuscan-style portico goes over to three sides of the courtyard. A fountain reflecting the traces of Renaissance period, in the wall, which adjoins the Church of Santa Maggiore. The fountain water streams into from a basin, which is made of an ancient sarcophagus. The sleeping goddess figure and a bust well to be dead interior Constantine were used for the decoration of the fountain. The spring a monte Sant' Angelo is represented with the reliefs in the nice, with the water falling into the villa, a cross rocks and plantation bringing out the magnificence of the local landscapes into the open. The other decorations are composed of eagles and branches of quince, forming a part of the d'Este coat of arms. Against the fountain, a medieval sarcophagus is established under the portico. The small Romanesque windows that are placed over the wall are believably possessed by the monastery's original structure.


Figure 5. & 6. The courtyard, Villa d'Este (Original, 2018)

- **The Palace**

A dual stairway leads to the upper floor from the courtyard, funds of which are used as a private apartment by Cardional Ippolito. Here are the most impressive rooms within the apartment: Salone Centrale, also named as the salon del Trono, of furnitured and chandeliers are from the Reggia di Caserta; the adjacent Stanza da lotto, Cardinal Ippolito's bedroom, with the magnificently coffered ceiling by the Flemish artish Flaminio Bollinger, as decorated with the d'Este coat of arms and the personal seal of Cardinal. Then opens a room, which was believably used as a library and personal studies. Frescoes by Emilio Moretti of the emblems of the old arts and crafts guild of Tivoli and other allegorical subjects (restoration year: 1928) decorated an aged chapel, yet the way to the main chapel, which is at the left-end of the apartment building. A corridor lead to appartamento Inferiore or lower apartment, which served as the guest quarters, entering directly to the richly decorated Salon Central, also known as the Fontana di Tivoli. Set into a wall on the right is a fountain with mosaic, enamel and stucco that acts as a frame for the relief representing this the so-called Temple of the Sibyl of Tivoli. The entire vault is decorated with frescoes begun by Girolamo Muziano and finished by Federico Zuccari and his pupils. At the center of the vault framed by colonnade of bold perspective, is Il Convito Degli Dei (the banquet of the God, the fresco is inspired by Raphael's painting in Villa Farnesina in Rome. The walls of this hall are also covered with later frescoes (recently restored). This second hall contains the painting of Phoebus racing in his chariot. And also, there are two small halls with frescoes by Girolamo Muziano.

- **The Garden**

Symmetrical myrtle hedges line up narrow lanes and they descend from the terrace into the Italian garden containing thousands of trees and plant species. The garden has terraces designed with inclination of slopes downward. The slopes are joined with a central longitudinal axis and five main transverse axes and many fountains on the edges of the villa are connected. The garden, the villa and its near environs are all harmonized. Nature bursts fourth in a grandiose and festive revelation green tints and threes, but an unseen hand conducts this grand symphony and human will guides its exuberant forces. These spurting and splashing water veils, serene fountains and clear ponds have pleased the users for centuries.

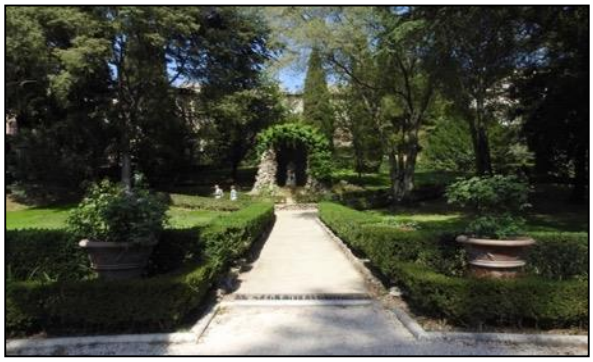



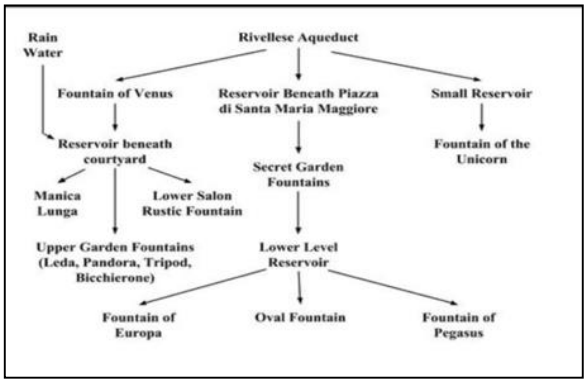
Figure 7 & 8. View of Garden, Villa d'Este, (Original, 2018)

The Hydraulic Water System of Villa d'Este

Water fountains have been used for thousands of years for climatic control, beautification, entertainment, and as a means for relaxation. Among the most popular fountains have been those that incorporate elements of surprise and/or special effects. These fountains elegantly combine both engineering and artistic features. Due to the inherent multidisciplinary nature of fountains and their appeal to the general public, there exists a great potential for enhancing engineering education by incorporating fountain-related activities in the curricula (Shakerin, 2014).

Villa d'Este was originally served by two sources: the Rivellese acqueduct and the conduit from the River Aniene. Both water sources flowed into several reservoirs and chambers throughout the garden, from which the water was directed to different features. The fountain systems were designed to minimize the impacts of these issues. The Rivellese aqueduct had incredibly low flow, outputting only about 5 L/s. This was addressed in the design in a few ways. First, several cisterns were constructed to collect the water and provide the volume and pressure needed for various fountains. In total, there is approximately one million liters of storage for the water supplied by the Rivellese aqueduct. Secondly, most of the fountains supplied by the Rivellese aqueduct had a relatively low water demand, such as the Fountain of Venus, the lower salon rustic fountains, or the upper garden fountains (see Fig 9). Finally, rain water that was collected in the roof of the palace was fed into the cisterns, adding more water to the system in the rainy season. However, even with all of these solutions, the fountains could only function for short periods of time, in order to allow the cisterns to refill with water. The Rivellese aqueduct was eventually replaced in the 1930s with water pumped from the Oval Fountain to the reservoir under the palace courtyard, from which it could be distributed into the original system (Barisi & Catalano, 2004). To feed the 51 fountains and nymphaeums with 398 spouts, 346 jets, 64 waterfalls, 220 basins (of various size and shapes), and 875 linear meters of water chains and canals, the entire garden with an intricate network of tunnels, canals and underground tubes comprise a highly refined and complex "hydraulic machine" which moves exclusively due to the force of gravity (Unesco Report, 2001).

The River Aniene source had a different problem. Whereas the Rivellese aqueduct had a flow of 5 L/s, the River Aniene output 500 L/s. Because of this reason the River Aniene source is used for the features with a much higher supply demand, such as the Oval Fountain, the Hundred Fountains, and the Fountain of the Dragons (see Fig 10) (Barisi & Catalano, 2004). The issue with the River Aniene source is related with slope. The conduit from the falls to where the source first lets out in the Oval Fountain is approximately 250 m long. Using location data gathered by a survey of the location of the conduit, the elevation at the source is about 221.3 m, and the elevation of the terminus is about 207.2 m. high. This is higher than the ideal slope, and could result in erosion to the conduit and part of the fountain (Engineeringrome, 2017). But, the system was arranged according to arrangement addressed this matter. The channel is basically a straight line extending from the source to the villa, and it stops first at the chamber situated above the oval fountain and distributed into the oval fountain and to other features there. The water can actually erode only in a small region and as soon as it reaches the tank, the water looses its energy substantially and it protects the delicate fountain equipment in the villa. The duct is somewhat straight and it allows water to enter to a few places to erode the walls. Another problem is prevented by the high slope: lime deposits. The villa is congested with lime deposits covering the surfaces and blocking the pipes and canals for the hardness of the water (Barisi & Catalano, 2004).



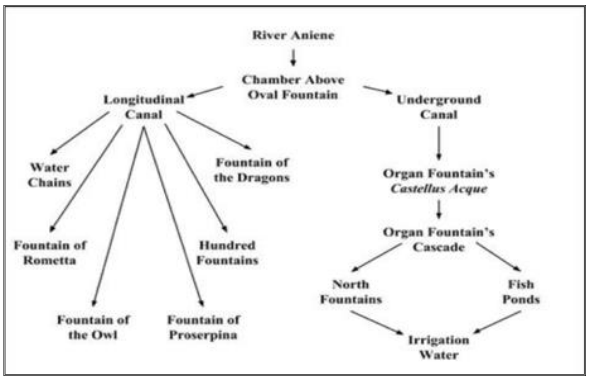


Figure 9. Fountains originally served by Rivellese Aqueduct (engineeringrome, 2017)
Figure 10. Fountains served by River Aniene (engineeringrome, 2017)

The idea was suggested to Pirro Ligorio by the extraordinary formation of the Tiburtine soil which was common even in ancient times for the exceptional abundance of water: beyond the principle brunch of the River Aniene which revealed itself in a spectacular waterfall beneath the acropolis, secondary streams ran like vessels underground, with collectors, tunnels and tubes which provisioned the building and public fountains and breaking out later in picturesque little cascades all along the fronts of the marble platform on which the city was constructed. Bringing water of the Aniene to feed Villa d'Este, imagined as it was like an artificial mountain perforated by multiple underground veins, analogous to the hills of Tivoli. The hydraulic facility, based on an understanding of ancient Roman technology illustrated in the works of Vitruvius and Frontino, constituted in its whole masterpiece of hydraulic engineering, not only for the many and fantastic water plays, but also for the general plan by which its water was delivered and distributed (Barisi & Catalano, 2004).

The scheme was planned in such a way so that the water draining from one fountain would then feed into the intakes of fountains on a lower level in the garden. Thus greatly reducing the total water needs of the complex and a simplification of the entire system. The first operation for bringing water (beginning 1560-1561) involved the Rivellese Aqueduct which fed the public fountain situated in the square across from Santa Maria Maggiore, from where the flow was broken into three channels. Water resource firstly entered the courtyard of the palace and served to the Fountain of Venus. The outflow from this fountain was used to fill the reservoir beneath the courtyard (which also served

as a cistern collecting rain water felling from the palace roof); from this cistern, tubes fed the fountain known as Manica Lunga, (Long Sleeve), the rustic fountain of the lower floor salon, and the fountains of the upper level of the garden (Leda, Pandora, the Tripod, and then the Biccierone). The second channel fed a large reservoir positioned underground in the Piazza of Santa Maria Maggiore and which, in turn provided flow into several fountains in the Secret Garden and another reservoir is existing still at the lower level. From this last reservoir the water flowed into the Fountain of Europa, the Fountain of Pegasus and into the upper part of the Oval Fountain through cascades in the rocks and water plays into the semi-oval gallery.

The third channel ran directly into the small reservoir which reserved the Fountain of the Unicorn in the Secret Garden. The flow of the Rivellese Aqueduct was modest (maximum 5 liters/second) and therefore the various cisterns, which provided a total of 1000 cubic metric of storage, indispensable for the various requirements of the complex. The fountains served by the Rivellese, therefore could only function for limited period of time. In 1564-1565, a more substantial conduit was built, following the paths of several ancient Roman canals, to connect up the complex with the water of the river Aniene slightly above the unique waterfalls, thus providing an unlimited flow- now determined to be 500 liters/second. The water from the Aniene entered the villa just above the Oval Fountain, where two chambers distributed them to their various destination and if necessary to the channels leaving out of the garden. There is a large canal running longitudinally which fed the hundred fountains, the Dragons, the Rometta, Proserpina, the Owl, and practically all the other fountains, including the Scalinetta dei Bollori, le Mete, and the other water chains boarding the stairs descending to the garden level. Another channel fed an underground canal which passed under the church of San Pietro, reaching the Castellus acque of Organ Fountain, then entering the second tunnel which fed the cascade under the Organ Fountain, from the terrace of the Oregon Fountain, the water reached the fountains on the north side of the garden and the fishponds, from where they collected in one of the three outlets which even today provide irrigation for agricultural and industrial use outside the city of Tivoli proper (Unesco Report, 2001).

- **The Rometta Fountain**

A marvelous avenue, bordered by Oaks and laurels turns off to the left from the Bicchierone, leading to a magnificent recreation area of some of the most significant structures in the ancient Rome. A solid perspective is presented by the wide platform, which is supported by a monumental foundation. It was designed by Pirro Ligorio, and maybe personally by Ippolito II, and built by Luzio Maccarone – the fountain builder- in 1570. It is accessible via a small bridge, spanning a curving canal, and there is a scale model of the Tibernia Island in Rome in the form of an ancient Roman boat in the center of this canal, with a course that represents the Tiber. The confluence of two streams, representing the Tiber and the Aniene separately comprises the canal. From the wall made of rocks the beach comes in the background; a statue of the Tiber cascades from the foundation of the statue representing the Aniene as the former springs from a cavern housing while the latter fall in fascinating and frothy.

It is still recognized as that the Rometta, as water gushes forth everywhere, in the air, on the ground, in the light and in the shadows is an expression of natural beauty. Flowing glasslike and transparent, daringly darting into the air, gently arching, gleefully falling down, crossing, overtaking and melting into one another, then disappearing iridescently into the air, within a glaring aura of life, light and celebration.

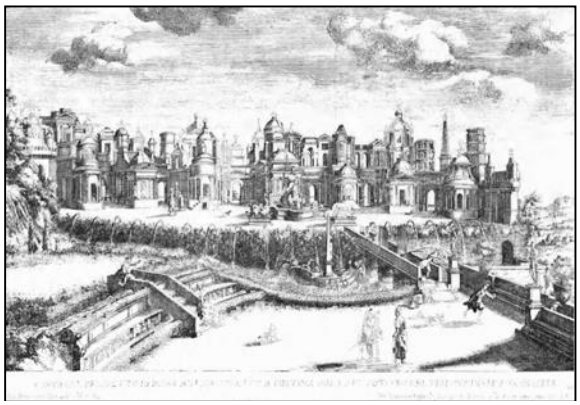


Figure 11. The Romenta Fountain (Original, 2018)
Figure 12. The Romenta, Villa d'Este (Ashby, 1907)

- **The Hundred Fountains**

The hundred fountains was very impressive when first structured with glowing marble, impeccable sculptures, vigorous waters, infusing in their sumptuousness, development and art. But it is no longer true- the marble is damaged and the leaking water uncovers the patina. The hundred fountains is situated at the sides of a long straight path that leads from the "Rometta" Fountain to the Fontana dell' Ovato. The water falls into three long parallel conduits situated on top of one another and creating one single water play. Hundreds of jets supply the thin spurts of water and represent the Aniene River running from Tivoli to Rome and flowing into the Tiber. Sculptures of lilies, obelisk, boats and eagles and all the Cardinal's beloved symbols hung above the highest channel: the lilies imply unforgettable France, the bats St. Peter and the obelisks. The eagle was displayed at the coat of arms of the d'Este family. The marble wall separating the upper channel from the middle one contains carvings with episodes from Ovid's Metamorphoses. However, a dignified mantle of verdant foliage hides the remains of these carving. The 100-meter-long path was designed by Pirro Ligorio and caused the formation of the two orders of overlapping basins on the uphill side. Despite the remaining part of the villa contains plenty of magnificent views with a mesmerizing beauty.

Figure 13&14. The Hundred Fountains (Original, 2018)

- **The Fountain of Ovato**

The path as coming from the Hundred Fountain, passing by the "bollori" stairs, and the Fontana dei Draghi on the left, leads to the Fountain of Ovata, alias the Fountain of Tivoli, which was built by Pillo Ligorio. The name of the fountain "Brown" comes from its egg-like, oval shape and it is probably the most typical baroque fountain within the villa. The fountain seems to be ornamented in particular, with the profusion of rocks and ornamental boulders, poured on it by Curzio Maccarone for conveying the aggressive ambient of Mount Helicon. The fountain is a harmonious piece of art in addition to its being impressive, and considerably pleasing for the whole part. The Pegasus over the fountain is placed quite well, seeming literally like being about to soar into the air.

Holding the hand of her son Melicerte, while symbolizing Tivoli, A simple statue of the Sibyl of Tiber is down at the central axis. Giglio della vellita, as Flemish sculptor, built this statue. Representing the Aniene and Herculanean rivers, the marble figures by Giovanni Malanca are placed on either side of the fountain.

With a marble balustrade overhanging the puissant and crystal-clear flow of water, dropping down in a resonating dome, the half Moon Terrace borders the elevated rocky part of the fountain. The basin under it is coated with semi-circle of pilasters, forming a nymphaeum. Vases are placed on the niche's status of nymphs, through which the water flows. The large shells with open valves are placed in the center of the basin, which are originally within the basin of the adjacent Hydraulic Organ. The basin parapet is coated with glaring ceramics, characterized with details of the d'Este coat of arms. There are tables having Roman feet and two stucco statues within their own niches against the Fountain. This scene is embellished by plane trees.

Figure 15 & 16. The Ovato Fountain (Original, 2018)

- **The Fountain of Organ**

Passing this wall, there is a small portal leading to a rectangular square, enclosed by low walls, at the end of which is situated the Fountain of the Organ. This fountain outmatches all its predecessors, not because of its decorative splendor but through its technical refinement and the ingenious secrets contained therein. This fountain is rustic rather than elaborately decorated. The lower part of it is built in the shape of a rock. At its base, there is a water basin in the shape of three half circles. Further up stands a modern statue, simply made of stone and shaped as a herm. This statue is representing nature—which is why they also call the place Fountain of Nature—topped by a female head with no arms, and a body entirely covered with big breasts hanging one upon the other' the lower part has the shape of a pointed pillar instead of legs, declining in diameter from top to bottom (Kaiser and Valleriani, 2016).

Behind this statue are 22 organ pipes, made to fit into a little vaulted niche above. Without any human intervention, the organ plays a musical piece with everything that comes with it, with beat and trills, by no means any less pleasing and melodic as the most gifted musician would perform. However, to make the spectacle appear even more admirable, there is an underlying mechanical construction. Beneath the rock-shaped structure of the fountain is a little subterranean chamber similar to a cavern, vaulted inside. There is no aperture whatsoever except above in one corner of the vault which is built in such a way that there is just enough space to let one man pass. In order to enter you have to lift a large rectangular stone sealing this aperture so closely that absolutely no air can get in or out. At one side, overhead, there is a thick tube of plumb. Water spouts from the vault through its outlet abundantly and with great force. And while the water is pouring into this chamber, this violent movement generates wind which stays within, enclosed and fairly compressed when the aperture is sealed. The increasing amount of water coming cannot find any exit except through a tube much thinner than

the one above, and the outward flow insufficiently drains the abundance of water trying to blaze a trail outside. Therefore, it remains in large parts in this little chamber, little by little rising more and more, pressing the wind ever more strongly (Kaiser and Valleriani, 2016).
The Hydraulic Organ, for which the fountain was originally named, was the ingenuous certain of Claude Venard, and was once one of the wonders of the villa. Water dropped through a conduit into an underground cavity, forcing a strong draft of air through the organ pipes. Another heavy jet of water slowly rotated a toothed copper cylinder mounted on an iron frame which moved the keys of the organs, playing madrigals and motets. The listeners found it difficult to believe that the music came from a simples hydraulic mechanism and not a band of hidden musicians. On the whole, this a fountain's living beauty makes it worthy of its great fame as one of the marvels of the villa (Barisi & Catalano, 2004).

Figure 17. The Fountain of Organ (Original, 2018).
Figure 18. The Fountain of Dragon Giovanni Francesco Venturini, 1700

- **The Fountain of the Dragons**

The Fountain of the Dragons or the Fountain of the Girandola is accessible through the cloudy path on the right of the Fountain of Ovato, which is the focus within the hearth of the gardens of Villa d' Este. Having a group of four horrid dragons "with wings and open mouths of the kind that frighten those who look upon them", the myth for this fascinating fountain was that it was built in one night on September 1572, when Pope Gregory XIII (where the dragons are featured by his coat of arms) was a guest at the villa. Producing a rapid succession of explosions, cannon shots and blasts with a resemblance to fireworks, like the ones which were set off at Castel Sant Angelo in Rome, the complicated waterworks by Tomasso da Siena is the reason why it was called as the Fountain of the Giranola (Barisi & Catalano, 2004).

Crowning the mighty jet of water that roars into the sky, while filling the air with echoes of pistol cracks, a number of the spouts have been subjected to restoration in the recent times. Creating the very first and originally a wide, stunning architectural structure, as is the custom, Pirro Ligorio designed and built this fountain. Separate levels are brought by two staircases that are in harmony, embracing the fountain while offering a perspective in regards to balance. The fountain which is charming in particular is also structured as a sculptural gem in addition to its architectural significance. Ending in a colossal oval basin, from the middle of the smooth ellipses of staircases four winged dragons with their masterly built heads raise, while their jaws are fearfully opened, emerge. Once embellished by esteemed statues, there is a fine nymphaeum in the center located behind the fountain and between two blooming side scenes. Decorating the backdrop of fountain in the past, the paintings of the mythological allegories of Jove have been completely lost yet a number of delightful mosaics have been put into their places.


Figure 19. The Fountain of Dragon (Original, 2018)
Figure 20. The Fountain of Dragon Giovanni Francesco Venturini, 1700

- **Fountain of the Owl**

The Fountain of the Owl, a well-known captivation as designed by Giobanni di Luca from in Burgundy and built by Florentine Raffaele Sangallo is located on the left of the Fountain of the Dragons. Swarm of metallic birds, singing in the sonorous tones of the flute and the ocarina, appeared all of a sudden on bronze branches being woven through the niches of the fountain by virtue of a complex mechanism and various water jets. Within a certain moment, a mechanical owl jumped out while shrieking its unwelcoming cry causing all the other birds flying away in fear. This astonishing performance could be operated either manually or automatically. It was Luc Le Clerk, the fountain builder, who constructed the hydraulic apparatus, yet the enthusiastic descriptions of the writers for the period are the only things left today.


Figure 21. The Fountain of Owl (Original 2018)
Figure 22. The Fountain of Owl (The Archvision Digital Research Library)

- **The Fountain of Proserpina**

With similar characteristics to the Fountain of the Owl in terms of architectural aspects, the Fountain of Proserpina was designed to bring together the separate levels of the villa. The fountain, which was built as an open-air dining room, is completed with a central nymphaeum, flanked by two niches which are enclosed by four twisted columns while being bounded by two staircases joining the challenging levels of the part. The structure is balanced quite well as a whole. The name of the fountain comes from the marble sculpture in the center of the nymphaeum depicting Proserpina while being kidnapped from Avernus by Pluto. As two Dolphins stir up the water, two silences play marine harps. Together with the twisted columns which were decorated with vines and tiny cherubs. This early 17th century marble group was recognized as one of the most charming baroque scenes in the villa. However, it is in a poor condition at present.

Figure 23 & 24. The Fountain of Proserpina, (Original 2018)

- **The Fish Ponds**

Built from three wide rectangular basins organized in a row, bordered by lush vegetation and animated by thin jets which spring from the vases decorating the balustrades, there are Fish Ponds in a bit further downhill. These Fish Ponds, along with the Hundred Fountains, are considered among the most charming sites of the villa. Harmony, tends toward perfection and serenity is turned into peace and natural beauty becomes poetry; the soul can finally rest and freely wander across the Elysian fields of the imagination. During the construction process, the fish ponds were used as a breeding area for choice species of fish. Adjacent to this area, deluxe kiosks were built for the ones intending to rest during a stroll, or for those who needed fishing tackle for catching fish. Hence, along with enjoying health surrounding and the enchanting water of fountains, the guests of the cardinal also had the opportunity to enjoy themselves b catching trout and fresh water fish out of the ponds. As noisy ducks fought with the trout and pikes for bread crumbs thrown by the pale hands of the cardinal, white swans wonderfully glided over the water. The swans are not here anymore, yet the amount of the fishes is still high, which are ready to surface for a bread crumb tossed onto the emerald water.

Figure 25 &26. The Fish Ponds (Original 2018)

- **The Fountain of Neptune**

Forming an astonishing background for the enchanting spot, the Fountain of Neptune is placed at the end of the lanes bordering the fish ponds. The Fountain of Neptune, without a doubt on being the largest fountain in the villa, was built by Attilio Rossi in the 1920s, it was grafted with several water display over the Pirro Ligorio's original waterfall, which had been a part of the nearby Hydraulic Organ with success; the fountain is balanced in all its various sections, the result turned out to be an architectural masterpiece. It seems to be growing smoothly out from the large base while gradually intensifying and becoming even more charming as it climbs up to be a part of the balustrade of the Hydraulic Organ. The symmetrical jets hurl skyward in a fluid pyramidal pattern reminding a vision of organ pipes that are in vibrating from. A number of rectangular patches of flowers and grass can be seen in front of the basin of the fountain. Dropping down on its own or shooting from numerous spurts, all the water comes from above.

Three connected nymphaeum lie just underneath the balustrade. Enclosed in nich vegetation while being enriched by trembling veils of water, these structures are the only remnants from Ligorio's original design along with the central cascade.


Figure 27 & 28. The Fountain of Neptune (Original 2018)

- **The Fountain of Nature**

Standing with a Statue of Nature taken from the Fountain of Hydraulic Organ, against a wall adjacent to the Villa's original entrance, the only other fountain of interest is the Fountain of Nature. Symbolizing the eternally fertile nature, as well as insuppressible flow of life, it is possible for the many breasted Diana of Ephesus to be a work by Giglio della Vellita. The workmanship of the statue is relatively tangled, yet someone would capture a bit of life's mystery and solitude with the passionate northern features.


Figure 29 & 30. The Fountain of Nature (Original 2018

Conclusion

Villa d'Este is one of numerous villas situated among the hills and mountains at the east of Rome, in the town of Tivoli. Ippolito d'Este, Cardinal of Ferrara and Governor of Tivoli commissioned it and designed by Pierro Ligorio. The villa is renowned for its many fountains and water features, supported by natural gravity . Artists, aristocrats and royalty gathered there to see the hydraulic wonders when it was first erected. Majority of the fountains have been restored to their original state today, and the villa continues to be a popular place in the close vicinity of Rome. The gardens of Villa d'Este contain many symbols, and their structure, statues, and decoration narrates of many stories like most Renaissance gardens. Both Ippolito d'Este and Ligorio were fond of classical antiquity and mythology, and the decoration and design of the villa bear great mark of this love. It can be seen the images of Jupiter, Neptune, Hercules and Venus are distributed throughout the villa.

Examining the Villa d' Este in terms of original design principles;

- Garden design has a formal plan scheme
- The garden is designed in sets according to the topography.
- Symmetry is generally applied in the plantation design and the formation of the grass parterres.
- There are various forms of water use in the garden. As "water theatre," the scala d'acqua water staircase, the artificial cascade, the Hundred Fountains etc.
- In terms of plant material; It is determined that there are usually tall trees, different shades of green, and plants that create seasonal and color effects are not included.

Table 1. Structural and Plantation Design Characteristics of Villa d' Este

Title	Details
Plan	The villa d' Este is designed on an informal plan scheme. The complex consisting of palaces and gardens forms an irregular rectangle and covers an area of about 4.5 hectares.
Building	The building in the villa complex consists of three floors. The main rooms of the villa are arranged in two-storey rows and each room opens onto the garden. The Cardinal's private apartment, which consists of four rooms, is at the same level as the courtyard and is connected to each other by a long corridor called Manica lunga. Reception rooms are located downstairs. The transition to the garden is provided through the main door located on the entrance floor of the building.
Axis	Despite the informal plan of the garden, parallel axes are included to create a formal order. There are five major axes transversely located in the garden. There is a central axle in the garden and 2 more axles in parallel on both sides of this axle.
Topography	The villa complex is designed in sets according to the topography of the land. There are four sets on the sloping land extending from the palace structure to the garden. The connection between the sets is provided with ladders and ramps.
Parterres	The garden design has a formal layout. Although the order of the parterres in the sets are different from each other, each set has a symmetrical plan in itself. Plant material was used as a border element in designs made in parterres.
Fountains	There are many fountains of different shapes and forms throughout the garden. The fountains consist of sculptures, pools, grotto, ornamental pool and similar materials. The water source used in the fountains is provided from the Aniene river.
Sculptures	The Garden has many symmetrically positioned sculptures, which are generally used as decorative objects in both gardens and fountains.
Accessibility	Access to the city (sea and land) and in-park circulation (access links between the lower and upper garden), access to the main focal points along the east-west axis, as well as access through the lower garden along the train line.
Entry and Exit Points	The main entrance and exit point is provided from the lower garden point, while the secondary entry-exit point is provided from the upper garden point (south direction) on the road connection.

Plantation Design	- Leafy and evergreen species were used together in a manner, creating a composition. - A design was presented in a manner constituting groups within the scope of plantation material use. - A harmony was created in the garden with various shades of green. - Some of the plant species in the garden are *Cupressus arizonica, Cupressus sempervirens, Quercus robur, Taxus baccata, Magnolia grandiflora, Hedera helix*

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