Physical Order and Disorder in Roman Architecture Style

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Abstract: Roman art and architecture is a combination of Etruscan, Greek, West Asia, Egyptian, and native art. However, roman art came into appear very slowly and late but it had a special survival. Initially, this art and architecture was under the influence of Etruscan architecture then was under the influence of Greek art. Architecture of this period was mostly interested in urbanization and urban planning. Temple architecture was not notified very much in building them, the plan and components were under the influence of Greek and Etruscan architecture. Building temple was not the central subject for Roman architects but their main topic in their work was summarized into constructing large and public buildings and monuments. Unlike Greeks, Romans needed more space inside temple. It should be noted that one of the major successes in roman architecture was discovering a new material which can be called concrete. Roman architect succeeded to resolve and provide interior spaces by enjoying concrete properties and created areas with various performances. Therefore Roman architecture is Space Making architecture. Max Bense who is one of the founders of informative aesthetic believes that, order has three degrees: chaos, being structured and being shaped. When we consider complete chaos that there are no regulations for connection between different components. In this case the possibility of prediction equals zero and innovation in maximum. Definition of being structured is one organized order with a structure that might have different forms. Bense calls the third part of order as a “chaos or disorganized order”. In all three factors above replacement of components affected by a general organization whatever the rate of order is more and this order is more complicated, the informative content is less. In this paper first we have introduced this style briefly, we described order and disorder in the architecture and we have analyzed Evidences of order and disorder in this style.

Key words: Physical order and disorder, Roman architecture style, Evidence

Roman Architecture Style:

Roman geographical location: a country which is called and known as Rome was founded on Tiber bounds, established its dominance over half of western Mediterranean, and eventually made its scope extended to all lands. Rome established its dominance over lands of ancient civilization, namely Egypt, Sumer, Babylon, and Greece. In west, it continued what Alexander had started, and has affected of Hellenic features on ethnic life and thought of those areas.

ROMAN ARCHITECTURE (300 B.C.-A.D. 365)
ARCHITECTURAL CHARACTER

The Romans adopted the columnar and trabeated style of the Greeks, and developed also the arch and the vault from the beginnings made by the Etruscans. This combined use of column, beam and arch is the keynote of the Roman style in its earliest stages. In the colosseum piers strengthen and faced by attached half columns support arches, which in their turn carry the entablature. In the aqueducts, the arch was supported on piers without the facing column. Thus the orders of architecture (Greeks used in constructively) were used by Romans as decorative features which could be omitted. The Romans added as Fourth and Fifth orders of Architecture the TUSCAN and the composite orders. The Tuscan order is a simplified version of the Doric order, about 7 diameters high with base, unfluted shaft, and simply, moulded capital, and with a plain entablature. The composite order was not evolved until the first century A.D.
The complex civilization and varied needs of the Romans introduced the types of buildings and necessitated the use of several storeys, which were frequently ornamented, as in the Colosseum, by attached half columns superimposed one above the other. The architectural aims of the Romans were essentially Utilitarian, and Thermæ, amphitheatres basilicas, aqueducts and bridges all testify to the great constructive ability they possessed.

The practical mind of the Romans hit upon greater economy of materials by the use of concrete, a hard composition which consists of small fragments of stone, such as tufa of its various kinds, peperino or Travertine, or broken bricks, laid in an excellent mortar of lime and well-selected sand or pozzolana. These concreting was done by skilled craftsmen with the help of slaves or soldiers of the Roman legions. Italian walls, both of stone and concrete, are of special character.

Wall of Opus Quadratum — example, rectangular blocks of stone with or without mortar joints but frequently secured with dowels or cramps, still continued in used stones 2 x 2 x 4 Roman feet in dimensions. Opus incertum — stones became quite small, and on the wall faces appeared in a loose pattern roughly resembling the polygonal work.

Opus recticulatum — at the time of Augustus it had assumed the net-like effect, with fine joints running diagonally, so that each stone unit was precisely square though set Lozenge fashion.

Opus Testaceum — brick facing succeeded the reticulate work became the hallmark of the imperial period in Italy.

Opus mixtum — final type — an alternation of course of brickwork and small, squared stone blocks.

It was upon the capacity to span over enormous spaces that the character of the Roman architecture largely depended. The Romans developed the stone arch of the Etruscans and already before the end of the Republic could bridge a span of 24.38 m (80 ft.) but it was, above all, the use of concrete which allowed the Romans to build vaults of a magnitude never equalled till the introduction of steel for buildings in the nineteenth century.

Concrete vaults had the advantage over stone in that they could be accommodated to complicated plan forms without involving difficult and laborious stone cutting. The vaults were supported on "Centering" or temporary wooden framework until the concrete has set. In important cases, such vaults were constructed of brick ribs, with concrete filling, the object being to lighten the load imposed on the centering and to guard against cracks.

Concrete — a composite material which consists essentially of binding medium within which are embedded particles or fragments of aggregate.

Vault — an arch covering in stone or brick over any building.

The various vaults used in Roman buildings were as follows:

a. ROMAN WAGGON VAULT — semi-circular or waggon-headed vault otherwise known as the BARREL or TUNNEL vault was borne throughout its length on the two parallel walls of a rectangular apartment.

b. ROMAN WAGGON VAULT WITH INTERSECTING VAULT
Groins — are line of intersecting of cross vaults.

or

c. CROSS-VAULT— formed by the intersection of two semi-circular vaults of equal span, was used over a square apartment and the pressure was taken by the four angles.

when cross—vaults were used over long halls or corridors, the hall was divided by piers into square bays, each of which was covered with a cross—vault, which allowed of the insertion of windows in the upper part of [ne walls, as in the central hall of the Thermae of Caracalla.

The Lines of intersection of these cross-vaults are known as “GROINS”.

d. HEMISPHERICAL DOMES—or cupolas were used over circular structures, and semi-domes for exedrae or semicircular recesses.

In these vaulting forms, concrete was the important factor for it was economical of skilled labor and had much greater cohesion than vaults made up of separate stone units. Yet it remained necessary to buttress the oblique sideways thrusts exerted against the walls by the enormously heavy concrete vaults which at the crown, were either 4 to 8 ft. thick. In complex buildings, the thrusts of one vault were balanced against those of another. The Romans concealed their buttresses with a masking wall.

Buttress — a mass of masonry built against a wall to resist the pressure of an arch or vault.

Three principal types of buttresses were used.

1. The hemicycle or niche, which is the best of all buttresses for retaining earth. This type was used on an enormous scale in the forum of Trajan, on the North East side, where the hemicycle cuts into the foot of the Quirinal galleries of shops and offices in three tiers conceal its utilitarian purpose.

2. The ordinary or "GOTHIC" type of "SPUR" buttress. The niche type was not very suitable for buildings where large openings for windows and doors were needed. Though a pair can be seen flanking the portal between the central hall and the frigidarium of the Thermae of Diocletian—so for convenience in normal buildings, it was squared—off into spur buttresses and a linking wall in which windows could be placed. The connecting wall, however, was put across the outer edge of the buttresses so that the space between them could be covered over with a vault and included in the useful interior accommodation.

The aisles of the Basilica of Constantine utilize the space between the great buttresses. In this way and the latter can be seen with their sloping tops, rising above the vaults of the aisles to catch the thrusts of the main vaults where they are concentrated in the pockets above the columned pillars.
3. The principle of the pinnacle was also used. Pinnacles were placed on the tops of spur buttresses to help by their weight to drive the oblique thrusts more steeply down to earth.

Their mundane purpose is disguised by architectural ornament in this instance by canopied sculptures. In buildings of which the walls were not too much broken up by window or other openings, the same principle was applied, but the extra load then ran continuously long the top of the wall outside the base of the vault, as an abutment, to reduce the danger of its collapsing outwards.

Pinnacle — a turret or part of a building elevated above the main building.

The Pantheon at Rome, the finest of all illustrations of Roman construction, embodies every form of Roman buttress. The building is two tiers high to the springing of the hemispherical dome inside, but there is an extra tier on the outside, providing rigid and weighty haunches to prevent the dome from splitting outwards and as an extra precaution, a further series of steps of concrete rises two-thirds the height of the dome. It is for this constructional reason that Roman domes are always saucer-shaped outside, though hemispherical within. The weight of the vault is reduced by omitting a portion at the crown — the most difficult part to construct to provide an "eye" which is the sole source of natural light. The 6.1 m (20 ft.) thick walls are not by any means solid; the decorative recesses inside are contrived within spur buttresses linking inner and outer shells, and between these recesses are constructional niches which run the full three-tier height and are crowned with semi-domes at the top of each tier; in the upper tiers they are split in half by spur buttresses. Thus all forms of buttress used later in developed mediaeval architecture was anticipated by Roman architects, but with the difference that the Roman were far less light and compact, and seldom plainly exposed to view.

Concrete vaults often were lightened by recesses or “COFFER” on the underside, but concrete does not lend itself to carved enrichment, like stonework, and walls and vaults normally received a decorative sheathing of plaster, Stucco, marble or mosaic. Various plasters of lime and sand were used outside, and plaster or stucco within. The latter was of marble dust and lime, and frequently was modeled into shallow, geometrical patterns; the panels thus created being ornamented with low relief figures and foliage, and painted in attractive colors. In such cases, the stucco was as much as 7.6 cm (3") thickness.

Marble was rarely used solidly throughout a wall; and only the white was so employed, never the colored. Normally it was just a facing, up to 30.5 cm (1 foot) or so thick when the marble was the native "LUNA" from carrara, but in mere veneers down 1.27 cm (1/2") thick in the case of colored marbles. Porphyry, marble, jasper organite reeers were laid against a stucco backing and secured to the walls by iron or bronze cramps.

Coffering — a ceiling with deeply recessed panels of —ten highly ornamented. (Coffer — one panel in a coffering)

They were arranged in geometrical patterns of different varieties (opus sectile) and were used in this manner too for floors.

Marble mosaics were employed to some extent for walls and vaults, but above all, for floors, in an infinite variety of geometrical and pictorial patterns. A humbler type of paving was "opus spicatum", made of small bricks set in herringbone pattern.

The abundance of statues brought from Greece led to the formation of wall niches for their reception, and these were either semi-circular or rectangular and were occasionally flanked by columns supporting a pediment, or were fronted by a screen of columns.
Physical Order and Disorder in Architecture:

The architecture is composed of different parts. The connection between these components has been organized. It means that all these components are subsystems of an organism. This system or organism might be very simple or complicated. Max Bense who is one of the founders of informative aesthetics believes that, order has three degrees: chaos, being structured and being shaped. When we consider complete chaos that there are no regulations for connection between different components. In this case the possibility of prediction equals zero and innovation is maximum. Definition of being structured is one organized order with a structure that might have different forms. Bense calls the third part of order as a “chaos or disorganize order”. When we talk about this order that in which all materials have been replaced that displaying the choices have been picked up freely and in united system.

In all three factors above replacement of components affected by a general organization whatever the rate of order is more and this order is more complicated, the informative content is less. But we should not think that more complication equals chaos automatically. This order couldn’t be recognize easily and could even cause mistake. More order equals less innovation. In complete chaos the probability of all components are equal, so squandering information equals zero and in consequence the possibility of new combination or maximum creation is possible.

Continuing of a style is in connection with order and squandering information and not to be with innovation. The contrast of styles comes from the difference of its components and its dominated order. In this case they have been more or less complicate and by means of that they have been connected by viewer or user. For example in Indian temples in India there is an order that they are not identifiable at the first glance because their components are almost complicated.

Order means obligation automatically. Whatever this order is sever the open space is less so it could be remained for the variety of components. And each part should obey these rules more and more. In a case that some these parts couldn’t even do their main task and in reverse a kind of complicated order creates more freedom and this freedom creates more open space for forming the components and causing opacity. The two kinds of orders, of course, have some exceptions just in a condition that the main factors of organism stay stable and without changing.

Buildings which are in order and are not flexible give us less freedom. In the other word changing one factor in this system could hardly possible. But in the opposite, these architectures give us their messages very clear and straight and nothing for personal interpretation for buildings with complicated order the issue is something else. Here in this case, we are completely free to act. Personal interpretation and opacity are possible. Such building expects us to be more active. We ourselves should discover the order of that and also search for its system. We can compare this building with Picasso’s painting named Guernica. In there also this is viewer wants to comprehend the painting and this is also the viewer who is obliged to search about the organism and thoughts, problems which lay behind of the painting.

Architectural styles of Mies van der Rohe and Venturi are eventually the same (Spectrum). The contrast between the two even influenced the choice of materials. But which one of these two styles is better or more beautiful?

For answering this question it would impossible find a definite answer. As we will see the value of aesthetic of objects could be measured or adjusted. This value equals with the consequence of the division of order by complication. Whatever a building is more complicated its organism should be more expanded that we will be able to find a measurement for its aesthetic.

Buildings with severe order like many of Mies van der Rohe’s works, either gives no opportunity to complication or it ends to chaos. In the other words, the Robert Venturi’s open order needs complication that wouldn’t be naively.

The important note is that in each style should be equivalent between complication and relevant order the comparison between two styles is impossible. We couldn’t consider any style as the best in architecture absolutely.

But which or who make it clear that how the dominated order should be, simple or complicated?

In T. Munro’s opinion that: the complication in an organism continuously being increased in an art till it makes studying harder occasionally. The consequence of this hardship is the general turning point and return to a more simplified organism. The trueness of this Munro’s idea could be confirmed by informative theory.

Peter smith proves that during architecture history, one phase with three steps is really recognition which has been repeated several times.

- A severe and distinct order dominates in first step. Coordination and simplicity has basic role in this era.
The main characteristic of second step is tension.

Lack of clarification and seduction are the main traits of third step. Order in here is that complicated which we are approaching to the maximum capacity of our conceptual.

There is a direct connection between the rate of regularity and division of information to semantic and aesthetics quota of semantic information and with the same ratio the effect of wisdom on emotion will be more and vice versa: when aesthetics information has had more quota or order is more complicated emotion dominates on wisdom.

An introvert person who is rationalist basically prefers the clear order and extrovert person is more emotionalists and prefers the complicated order more.

**Evidences of Order and Disorder in this Style:**

Main characteristic of Roman space is based on strength and symmetry reins the circular and rectangular spaces. In the second architecture of interior spaces, working with archives and central plans has an important role.

They know Roman zoy as” a strong inspiration to volumetric and spatial spaces and ultimately an inspiration about architecture”.

- Urban design was based on a raster network. (Based on their religious beliefs they were dividing the sky into four areas according to four main directions.)
- Surrounded military camps, named kestra or rectangular plan, has also had raster network and often were converted to the cities.
- Vitruvius, architect and urbanize (first century BC), was the author of the thesis "Ten Books About Gusset architecture" who was serving in Roman military with commandment of Julius Caesar.

In his view the houses of natural sample have been awning (shelter), bird nests, and caves. In his opinion the first architecture is an "art and science" that is the result of superior art.

He believes that architect should be theorist, writer and at the same time should have extensive knowledge. Knowledge of geometry, perspective, light laws, mathematics, astronomy, philosophy, music, medical science (for climate and soundness of building), and etc. are necessary for the architect. In his point of view, architect should be faithful to rules: static (building and mortars), efficiency, and beauty.

Roman history links to the history of city of Rome and according to a legend city of Rome was built ordered by Romulus in 753 BC.

By creating roads, laws, and its powerful military, Roman Empire generated an organized transportation which caused the appearance of cities.

By constructing dams, bridges, roads, water canals, theatres, squares, public baths, triumphal arch, paved roads Roman citizenship civilization (Latin) left lasting effects across the world from Scotland to Persian Gulf.

In spite of magnificent buildings and statues that every emperor was leaving, the Romans had a great interest in large buildings. Therefore, there was the need for heavy, stable, durable, tough, and strong mortars. Actually, because of having Puzulan cement which was the best cement in the world, they were successful in constructing good buildings.

Romans created the half circle (melody) arch first which did not have static structure, then with an innovative way, they constructed composite or transverse arch which consisted of two melody arches that were perpendicular to each other.

**Conclusion:**

Main characteristic of Roman space is based on strength and symmetry reins the circular and rectangular spaces. In the second architecture of interior spaces, working with archives and central plans has an important role. Knowledge of geometry, perspective, light laws, mathematics, astronomy, philosophy, music, medical science (for climate and soundness of building), and etc. are necessary for the roman architect. In his point of view, architect should be faithful to rules: static (building and mortars), efficiency, and beauty.

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