SPACE AND TECTONIC. AN INTERPRETATIVE KEY TO THE RELATION BETWEEN ARCHITECTURE AND CONSTRUCTION

Francesco Defilippis
dICAR Department / Polytechnic University of Bari
via E. Orabona 4, Bari, Italy
francesco.defilippis@poliba.it

ABSTRACT

The paper deals with the relation between idea of space and tectonics from a point of view that tries to extend the concept of tectonics to all the building systems and give it a syntactic nature, capable to determine or at least condition the characters of the architectural space. The dissertation is based on the conception of tectonics as “art of joining”, that is, as a syntax that presides over the relations between the elements of construction, independently from the building systems, the building techniques and the nature of the construction materials.

According to this interpretation, the concept of tectonics can be applied to all the building systems, which are generally ascribable to the two basic building systems: the trilithic system and the masonry system. This means that it is possible to talk about the tectonics of the trilith as well as about the tectonics of the wall, since both imply the assembly of elementary ‘pieces’ according to different principles, that is, according to different syntaxes congruent with the respective static-constructive logics of the two systems themselves.

In architecture, therefore, tectonics has the same syntactical nature of building type. In order to clarify this analogy, we could say that tectonics is to construction as building type is to form.

As a syntactic principle that governs the relations between the elements of the building system, tectonics confers on the built form the characters intrinsically linked to its relational law; therefore, it is at the same time a technical and aesthetical category. For this reason, the choice of a building system is not and cannot be a choice disconnected from the process of definition of form.

The recognition of this ‘expressive’ value of tectonics inspired and determined in the past the development of the building systems; it influenced their choice in relation to their intrinsic differences that are

certainly ascribable to their different spatial 'vocations'. On this recognition, that implies the attribution of specific characters to the building systems, it is possible to found an interesting interpretation of the relation between idea of space (both architectural and urban) and construction, according to which it is exactly the relation with the different ideas of spaces that justifies the different syntaxes defining the tectonics of the different building systems, developed in order to correspond to those ideas, and makes them significant.

This interpretation of the relation between space and tectonics can enlighten the difficult - and often confusing - relation between form and construction in contemporary architecture, where construction, pushed ahead by technological innovation, tends to have an autonomous and self-referential role.

KEYWORDS: space, tectonics, building systems, constructive syntaxes, architectural characters

INTRODUCTION

These considerations about the relation between space and tectonics in architecture are based on the conception of tectonics as "art of joining" (Borbein, 1982), that is to say as a syntax that presides over the relations between the elements of construction, independently from the building systems, the building techniques and the nature of the construction materials. According to this interpretation, the concept of tectonics can be applied to all the building systems, which are generally ascribable to the two basic building system: the trilithic system and the masonry system. This means that it's possible to talk about the tectonics of the trilith (architrave above columns/pillars) as well as the tectonics of the wall (stone blocks or bricks assembled together in different ways), because both generally imply the assembly of elementary 'pieces' according to different principles, that is, according to different syntaxes, congruent with the respective static-constructive logics of the two systems themselves.

TECTONICS AS CONSTRUCTION SYNTACTIC STRUCTURE

The distinction between 'tectonics' and 'stereotomy', derived from Gottfried Semper, creates confusion about the same concept of tectonics, as it implies its exclusive belonging to the trilithic or frame system. Kenneth Frampton himself is aware of the limits of this oppositional duality when he recognizes that even the "masonry, when it does not assume the form of a conglomerate (…), that is to say when it is bonded into coursework, is also a form of weaving, to which all the various traditional masonry bonds bear testimony" (Frampton, 1995).

Stereotomy (literally "cut of solids", from the Greek words *stereós* = solid and *tomía* = cut) constitutes, in the field of the masonry building system, the corpus of the theoretical and technical knowledge regarding the design and the construction of the cut-stone vaulted structures. The 'stereotomic' architecture, constitutively provided with geometrically and statically complex vaulted structures, is governed by a constructive syntax, that is, by a tectonics that confers its general characters and allows us to distinguish it from a 'trilithic' or frame architecture, which is governed by a different tectonics.

Once this duality is overcome, the concept of tectonics assumes a general value attributable to all architectures, with respect to which it is possible to recognize the differences between the building systems, between their constructive syntaxes and their specific characters.

In architecture, therefore, tectonics has the same syntactical nature of the building type since both express a relational 'structure'. We could say, in order to clarify this similarity, that tectonics is to construction as building type is to form.

As a 'syntactic' principle that governs the relations between the elements of the building system, tectonics confers to the built form the characters intrinsically linked to its relational law; therefore, it is at the same time a technical and aesthetical category. For this reason, the choice of a building system is not and cannot be a choice disconnected from the process of definition of form.

The recognition of this expressive value of tectonics inspired and determined in the past the development of the building systems; it influenced their choice in relation to their intrinsic differences that are certainly ascribable to their different spatial 'vocations'. On this recognition, that implies the attribution of specific characters to the building systems, it is possible to found an interesting interpretation of the relation between idea of space and construction, according to which it is exactly the relation with the different ideas of spaces to justify and make significant the different syntaxes that defines the tectonics of the different building systems, developed in order to correspond to those ideas.

Auguste Perret, in one of the epigrams of his treatise *Contribution à une théorie de l'Architecture*, after defining architecture as the unique between the arts devoted to the creations of space, deals with the issue of the relation in architecture between space and construction, between the idea and character of space and the building system. According to him, if the supreme purpose of architecture is "the thoughtful making of spaces" (Perret, 1952), the building systems and the techniques corresponding to them can only be defined and developed in accordance with this purpose.

Indeed, the history of architecture teaches us that the invention and development of a building system, the definition of its constructive 'grammars' and syntaxes, are closely linked to an idea of architectural space; its use is determined by the intention to explore and represent this idea according to the character of the building.

In the great constructive cultures of the past this relation is always clear: their architectural works never derive mechanically from the simple availability of a building technique; on the contrary, they are exactly the development and use of a building technique to derive from the will to achieve through the built forms certain spatial results,

connected to a defined conception of architectural space. And it is from this primary will that the technique gets its meaning and value.

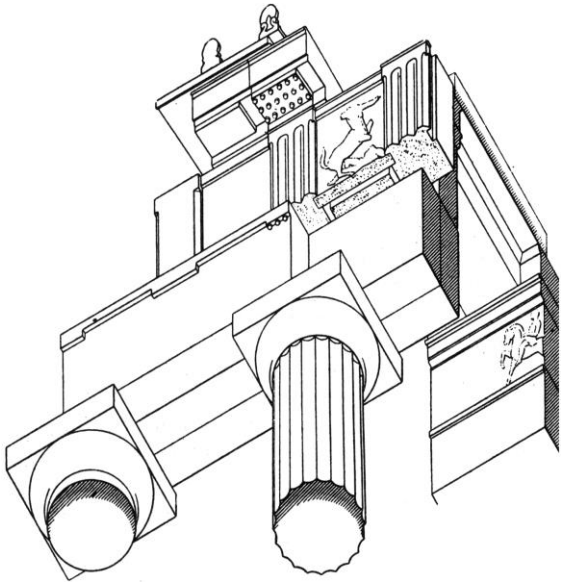


Figure 1: A. Choisy, constructive knot of a Doric temple (Choisy, 1899)

In this perspective, the trilithic system, the masonry vaulted system and their variations and combinations can be considered as the technical 'means' through which the different conceptions of architectural space have been realizing and expressing themselves through time.

The trilithic system, as defined and codified by Greek civilization in the classical age, shows its adequacy to the condition of "externality" connected to the idea of space pursued and represented by Greek architecture. Greek temple is the clearest example of "architecture mainly developed, almost exclusively, as an exterior" (Brandi, 1956); it tends to define itself like a solid volume, like a sculpture, and its peristyle, constructively defined by the combination and juxtaposition of discrete elements (columns and architraves), always recognizable in the tectonics of the building, assumes the role to define and express it as an "exterior", revealing its congruence with the idea of Greek space and its dominant theme of "externality" (Brandi, 1956).

Instead, the masonry vaulted system is constitutively linked to the idea of "internality" (Brandi, 1956). It has been used from those building

experiences that pose the construction of the interior space and the representation of its values at the basis of the architectural expression.

As Sergio Bettini maintains talking about Roman architecture, “it is the will to shape interior spaces in tension between them that leads to accept and develop arches, vaults and domes” (Bettini, 1978) and to make of these ancient elements, ignored by Greek civilization, the cornerstone of a new architecture based on the idea of architectural space as an interior “hollow” space. In fact, the wall, as continuous opaque element, the vault and the dome, as masonry elements that are moulded to cover the space, evoke spatial values of “internality”. Their continuous, homogeneous, concave surfaces seem to have this vocation to delimit, enclose and contain space, that is, to define “spatial cavity” and not simply enclosed spaces. Considering the interest of the Romans toward the idea of space focused on the expressive values of “internality”, it is not a coincidence that the masonry vaulted system, already used among other previous civilizations, was developed and widely used in the Roman civilization, which was able to recognize its vocation and spatial characters and make them corresponding to its own idea of architectural space as interior hollow space.

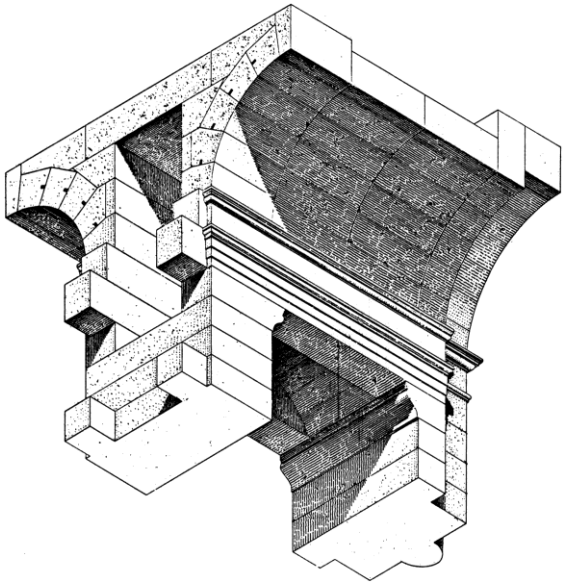


Figure 2: A. Choisy, constructive knot of Roman amphitheater in Arles (Choisy, 1873)

Therefore, the lesson of Greek and Roman architectures is paradigmatic: they show us that the building systems have an intrinsic spatial 'vocation', that is, the capability to confer to the built space their specific characters, related to the form of the elements and their constructive syntaxes: the 'finiteness' of the elements and the distinction between vertical/load-bearing elements and horizontal/borne elements of the trilithic system and the continuity and homogeneity of the parts of the masonry system; the three-dimensionality of the column and the two-dimensionality of the wall; the lightness, linearity and the 'airiness' of the trilithic system and heaviness, opacity and massiveness of the masonry system.

These characters, directly represented through the forms of construction, determine the characters of the built space. In the trilithic construction the discontinuity between the elements and their finiteness determine the character of "externality" of the architectural space. Instead, in the masonry construction they are the thickness and continuity that characterize it in order to connote the "internality" of space.

Figures 3, 4: Athen, Efesteion, 450 B.C; Rome, Basilica di Massenzio, 310 A.D. (photos of the author)

SCHINKEL'S ARCHITECTURE AS A PARADIGM

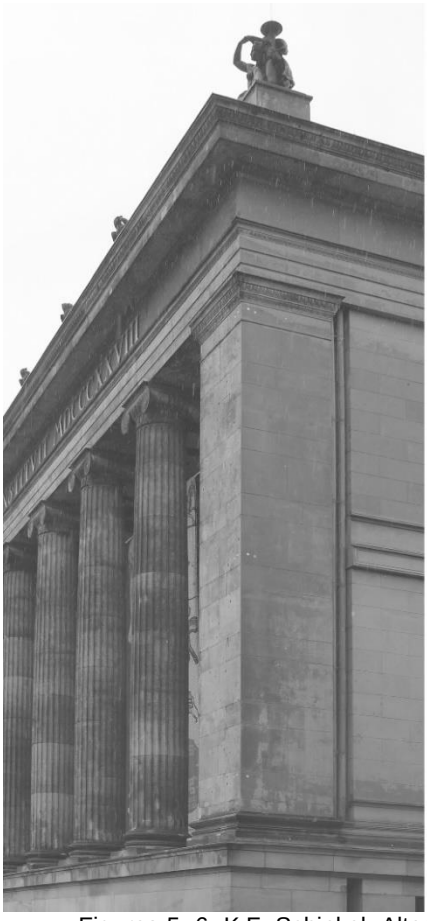
For this interpretation of the relation between idea of space and tectonics the architecture of Karl Friedrich Schinkel has for us a paradigmatic value. In his works, Schinkel uses both building systems (the trilithic and the masonry) 'inflecting' and interpreting them according to the styles of his time. Often, he uses them in the same building by giving each of them the role of defining different spatial conditions, corresponding to the ways in which the building defines its typological theme and relates to the place.

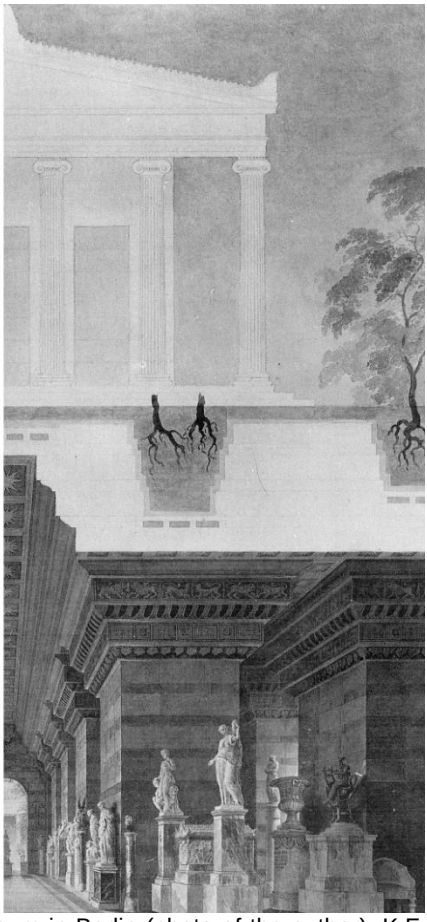
About these, two works are paradigmatic: the Altes Museum in Berlin and the Palace in Orianda, with its Crimea Museum, an unbuilt work designed for the czarina of Russia.

In the Altes Museum in Berlin Schinkel expertly 'blends' the two building systems to respond to the two constitutive themes of the building: defining an interior 'introverted' space, aimed to accommodate the place of the museum, and at the same time establishing a meaningful relation with the external space of Lustgarten with the objective to delimit it on the north side and turn it towards the Spreekanal and the urban axis of Unter den Linden. The volume of the building, a rectangular base parallelepiped, is identified by four cantonal stone pillars that rest on a podium and seem to bear the entire roof, identified by the continuous band composed of the lintel and the overlying cornice. Three of the four lateral faces of the volume (corresponding to the side and back façades) are closed by stone walls 'discretized' by the openings of the two orders of windows and by the intermediate architrave, which stops at the corner pillars. The fourth face, corresponding to the façades facing the Lustgarten, is instead defined by a giant order consisting of eighteen Ionic columns having the same height of the corner pillars. Behind this row of columns, at a distance of about three meters, a wall with no openings, less thick than the walls that define the volume of the building, separates the internal space from the external one, opening only in correspondence of the access staircase. Schinkel uses, therefore, the masonry system to define the characters of "internality" and introversion of the space of the museum, which are exalted in the central domed space; instead, he gives to the trilithic system the role of construction of the relation between the building and the open space of the square-garden, relation resolved by the beautiful and airy *loggia*, a sort of Greek *stoà* whose open oriented space mediates between the "internality" of the space of the museum and the "externality" of the square and make meaningful the position of the building in the urban context of the Museum Island.

The Crimea Museum, placed in the 'introverted' space of the main courtyard of the Palace in Orianda, consists of two parts: a rectangular base stone podium, arranged along the main axis of the composition, which raises up over the top of the courtyard enclosure a *belvedere* pavilion, totally open towards the landscape. The podium is conceived as a part of the ground, a 'telluric' architecture firmly anchored to the ground as it was obtained from it by carving. It raises in the space of the garden as a compact and massive block, engraved on the sides by the stairs going up on its top, whose nature of 'ground' is enhanced by the

trees that are planted on it. Its interior space, aimed to accommodate the Museum of Crimea, evokes the characters of the spaces of hollow underground architecture, spaces obtained by subtraction of material, carving the solid and compact mass of the rock. The tectonics of the building system and the form of the elements converge in the achievement of these characters.





Figures 5, 6: K.F. Schinkel, Altes Museum in Berlin (photo of the author); K.F. Schinkel, Museum of Crimea (drawing of W. Loeillot, 1847)

The *belvedere* pavilion is, instead, a peripteral temple without cell. Its airy and light volume, defined by two rows of columns and by the roof, is in a strong contrast with the massiveness of the underlying podium. The space of the museum with its character of “internality” is in

consonance with the character of “internality” of the space of the imperial courtyard; instead, the open and airy space of the pavilion interprets the relation of the entire building with the place, defining and characterizing a panoramic viewpoint completely open towards the extraordinary surrounding landscape.

CONCLUSION

In both works Schinkel uses the building systems, carefully chosen for their respective spatial ‘vocations’, as means of expression of form, that is to say as ‘tools’ necessary to confer on the architectural form and space the characters that they must have according to the themes and meaning of the building. For the parts that need to express lightness, airiness, “externality”, ‘extroversion’ he chooses the trilithic building system, highly represented by the Greek order; conversely, for the parts that need to express massiveness, delimitation, “internality”, ‘introversion’ he opts for the masonry building system, ‘decorated’ by the form, rhythm and proportion of the openings and by the representation of the construction principle (through the visibility of the masonry texture as result of the disposition and stratification of the material). This correspondence between idea of space, building system and decorative system, conceived as an analogic system representative of the construction itself (Monestiroli, 2002), their concurrence in the common representative purpose of the building’s theme and character make architectural form expressive and meaningful.

Figures 7: Eric Ruiz-Geli, Media ICT Building, Barcelona 2010 (photo: innochain.net). Best Building of the World by WAF, 2011

This is Schinkel's lesson, this is the lesson of history of architecture for our time, dominated by technological progress, which independently develops innovative construction systems and materials, and increasingly characterized by the self-reference of the technological paradigm and by the ostentation of the construction technique as it was the main purpose of architecture.

REFERENCES

Bergdoll B. 1994. Karl Friedrich Schinkel. An Architecture for Prussia, Rizzoli International Publications, New York.

Bettini S. 1978. Lo spazio architettonico da Roma a Bisanzio, Dedalo, Bari.

Borbein A.H. 1982. «Tektonik, zur Geschichte eines Begriff der Archäology», in: Archiv für Begriffsgeschichte, XXVI, n. 1.

Brandi C. 1956. «Arcadio o della Scultura. Eliante o dell'Architettura», in: Brandi C., Elicona II, Einaudi, Torino.

Choisy A. 1899. Histoire de l'Architecture, Paris.

Choisy A. 1873. L'art de bâtir chez les romains, Paris.

Defilippis F. 2012. Architettura e stereotomia. Caratteri dell'architettura in pietra da taglio in area mediterranea, Gangemi, Roma.

Frampton K. 1995. Studies in Tectonic Culture: The Poetics of Construction in Nineteenth and Twentieth Century Architecture, MIT Press, Cambridge (USA)

Monestiroli A. 2002. «La metopa e il triglifo. Rapporto fra costruzione e decoro nel progetto di architettura», in: Monestiroli A., La metopa e il triglifo. Nove lezioni di architettura, Editori Laterza, Bari.

Perret A. 1952. Contribution à une théorie de l'Architecture, Éditeur André Wahl, Paris.