Chapter 18
The Relief–Perspectives of Bitonti and Borromini: Design and Representation of the Illusory Space

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ABSTRACT
The research represents principles of projective-geometric design of illusory spaces and proposes a study about the relief-perspective which featured the applications of science and art to interior decoration and architectural spaces during the sixteenth and the seventeenth century. The research has analyzed a selection of figurative and built illusory spaces, going to deepen the formation of the concepts of perception and illusion. During Renaissance was given emphasis to projective methods, of which were investigated the principles of geometric and optical ones in the proportions and in the visualization of architectural works, and the use of projective system accelerating or slowing the effects of the natural perspective to modify certain environmental aspects, external and internal, to the built volumes. The research also compares two major applications, the relief-perspectives of Francesco Borromini and Giovanni Maria da Bitonto and their partnership in the design of the perspectival tabernacle in Bologna and in the perspectival gallery for the Spada palace in Rome.

INTRODUCTION
The research highlights and represents the principles of projective-geometric design of illusory spaces and proposes a study about methodologies for the relief-perspective which featured the applications of science and art to interior decoration and architectural spaces during the sixteenth and the seventeenth century. The fundamental contents of each illusory design is the visualization or the materialization of the three-dimensional space, from the graphic concept to the extension of architectural surfaces; the process develops a computed figurative palimpsest.

The research has analyzed a selection of figurative and built illusory spaces, going to deepen the formation of the concepts of perception and illusion from antiquity to Renaissance, and to Baroque. During Renaissance was given emphasis to projective methods, of which were investigated the principles of geometric and optical ones in the proportions and in the visualization of architectural works, and the use of perspective as a projective system accelerating or slowing the effects of the natural perspective to modify certain environmental aspects, external and internal, to the built volumes.

The research also analyses two major applications of perspective, the relief-perspectives of Francesco Borromini and Giovanni Maria da Bitonto; their partnership was in the design and construction of the perspectival tabernacle in Bologna and in the perspectival gallery for the Spada palace in Rome.

The deepening of the manuals and treatises written and circulated in Italy and France, like the Traité de perspective-relief by Noël-Germain Poudra (1860), made possible the diffusion of methodologies to transform the architectural space through the perspective rules. The figurative or material construction of illusionary spaces, precisely the relationship between perspective rules and the necessary practical realization, constitutes the most exciting theoretical and practical universe for scientific investigations.

THE INVENTION OF SPACE (AND TIME) THROUGH ITS REPRESENTATION

Before the perspective was intended as an application of the Euclidean geometry, it was used as an intuitive expression of signs, in the attempt to reproduce the retinal image of an observed object into the real world. Painters of the twelfth century, thanks to the particular cultural conditions of the time, started to compare the perspectival tools with a broader understanding of its geometric meaning; scholars believed that it was the fundamental tool to fix the connection with the optical theories of representation.

The cultural and scientific information imported from the medieval world is a contribution of Islam whose philosophers and scientists had translated into their language most of the scientific documents of antiquity. The manuscript of Ibn-al-Haitam (better known as Alhazen) (965-1038) about optics had notoriety in Western culture, having been translated from Arabic into Latin by the Polish monk Vitellione in the thirteenth century. The works of Euclid itself were translated into Latin, at the end of the twelfth century, by Abelard of Bath, not from the greek, but from Arabic. The treaties about perspective, written by the Bishop of Lincoln, Robert Grossteste (1175-1253) and that one of Canterbury, Roger Bacon (1270), found inspiration in the knowledge possessed by the Islamic culture.

In this era the strong connection between the perspective of philosophers, the perspectiva naturalis and the one of painters, the perspectiva artificialis or pingendi, both arising from the optics of traditional Euclidean geometry, started to be a universal concept.

It is unknown in which way knowledge of geometry and psychology of vision introduced by the greek, arab and latin treaties of optics, very popular in the XIII and XIV, have generated techniques to experiment illusionistic sculpture and architecture, optical corrections and, about painting, systems of representation of the three-dimensional space of perspectival type, which spreaded precisely in this age (Fano, 1979). The issue is particularly complex in the case of the project of architectural space, since the use of optical corrections, as well as measures aimed to create special perspective effects, were evidenced in the first half of the twelfth century in the West before the introduction of the study of optics. The treaties of optics related to Euclid and Alhazen had introduced both mathematical and geometric statements and also psychological concerns addressing comments about parallel lines vision and distance evaluation through comparison with known quantities. The practical solutions, suggesting the extension