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## Case study

# Garden cultural heritage spatial functionalities: The case of anamorphosis abscondita at Vaux-le-Vicomte



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## ABSTRACT

This paper analyzes the phenomenon of spatial functionalities for garden cultural heritage design and the relationships between the sizes of the sections and elements of the baroque garden of Vaux-le-Vicomte and the specific visual phenomenon, anamorphosis abscondita, that was used in the design of this garden. The interpretation of the optical illusions in the garden of Vaux-le-Vicomte was achieved by using geometrical analysis of the rules of linear perspective. The anamorphosis abscondita was examined through the viewpoints of the garden using the ground plan and longitudinal section of the garden, photographs and a virtual 3D model. The visual impression of the phenomenon anamorphosis abscondita formed in the eye of the observer, in relation to the reality of the garden, is confirmed through the geometrical analysis. Anamorphosis abscondita introduces a compulsory perceptual path to the observer of the garden. This pattern of deformation in certain parts of the garden creates in the viewer's eye a sense of infinity in space. The 3D scene of the garden is characterised by a large amount of spatial and visual information, which is located at different distances from the observer. The quality of visual information in such a space leads to a change of the object of interest. Perspectives and optical illusions influence the design of the garden at Vaux-le-Vicomte, and the terraces and axes of symmetry are important tools in its spatial organization. The axis of symmetry contributes to the clarity, depth and order of composition. The parameters that influence the phenomenon of anamorphosis (distortion): the height of the eye point and the distance both affect the visual illusion of the change in size (depth of scene).

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## 1. Introduction

For most artistic disciplines, achievements are either two-dimensional (paintings) or three-dimensional (sculpture, architecture). The landscape architecture, more than any other art, affects the fourth dimension – time, which is the dominant element of the garden's living material – the plant. The limited duration of a plant's life affects the garden's relative ephemerality. The manipulation of change is one of the basic skills that contribute to the diversity and attractiveness of a green space [1–7].

The aim of this study was to analyze the specific phenomenon of anamorphosis abscondita realized in the baroque garden of the Vaux-le-Vicomte castle. The interpretation is achieved using perspective projection. The detection of new information concerning

the genesis and the dynamics of distribution of this heritage craft was certainly an additional aim of the research [8].

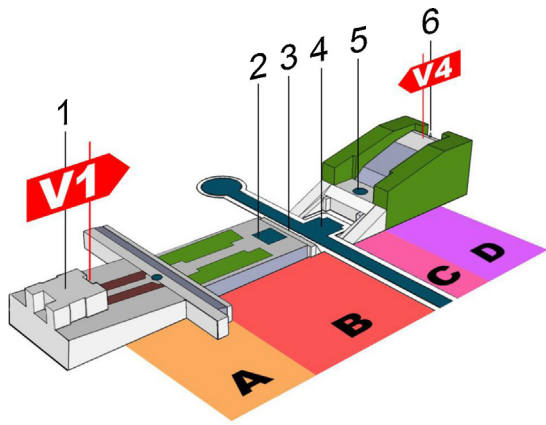
In the mid 17th century, André Le Nôtre designed the baroque garden in the area surrounding the old castle of Vaux-le-Vicomte. The configuration of the terrain allowed Le Nôtre to consciously manipulate space [9] (Fig. 1).

Anamorphosis abscondita is defined as a distorter projection or perspective, requiring the viewer to use a specific vantage point to reconstitute the image. Optical anamorphosis is a method where by the observer's visual perception of the scene's composition looks different from its reality. Anamorphosis is not an aberration where reality is subjugated by vision or the mind. It is optical subterfuge where appearances eclipse reality [10,11]. In general, anamorphoses are classified into two main groups: surface anamorphic images and reflective anamorphic images [12].

The anamorphosis applied in this garden belongs to the optical, planar anamorphosis. As anamorphosis abscondita creates visual effects that are not found in nature, the viewer experiences tension between the natural perspective seen by the peripheral vision and the altered perspective of the formal garden.

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**Fig. 1.** Axonometric view of the central part of the Vaux le Vicomte garden 3D model. A. Parterre de broderie; 1: Château. B. Parterre de gazon; 2: Confessional and reflecting pond; 3: Grandes cascades and path. C. Grotto; 4: Grand canal. D. Tapis vert; 5: La Gerbe; 6: Hercules.

Research aims: the aim of the study is to identify the existence of anamorphosis abscondita in the garden of Vaux-le-Vicomte by means of geometric principles, using central projection. The realistic scene is shown spatially by linear perspective, while the distortion of individual parts of the scene in the perspective drawing is a change result. Where anamorphosis is concerned, distortion is the desired effect. The scene is deformed and unrecognizable when viewed directly. However, when such a distorted scene is observed from a specific point, in the eye of the viewer it looks realistic [13].

The problem is solved in two ways: by using a mesh projected onto perspective photographs taken from the most distant points, from the stairs of the chateau and the statue of Hercules, and by

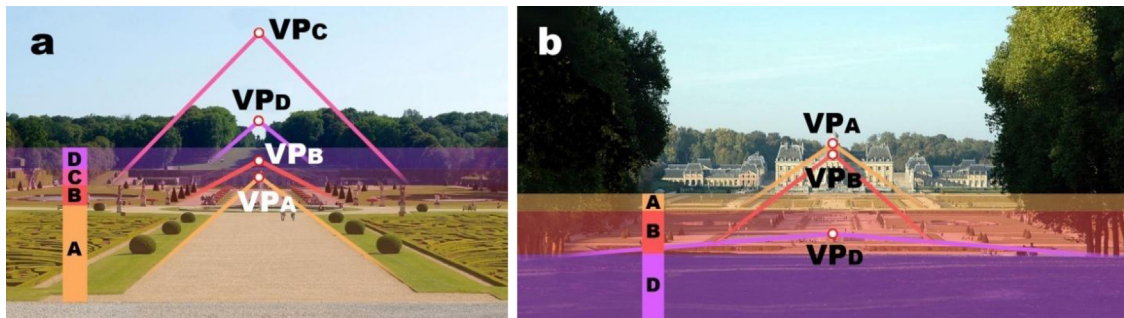
the analysis of the 3D model of the garden and the histogram representing the illusory length of certain segments of the garden, viewed from selected points along its longitudinal axis in comparison to the actual lengths [14].

**2. Research methodology**

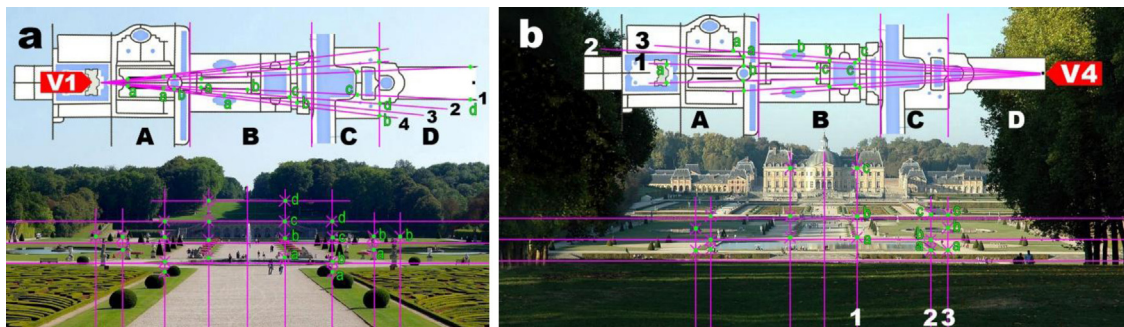
Lines composed of an orthogonal projection of the visible rays of plane and mutually parallel lines representing the parts of the garden A, B, C and D were used in the geometric analysis of optical illusions where anamorphosis abscondita in the garden was designed to either decelerate or accelerate the perspective. The method is based on the following geometry constrains which are parallelism and perpendicularity as well as coplanarity and symmetry of garden elements. [15] The trapezoid mesh that is placed over the horizontal projection of the garden is seen as an orthogonal mesh (Fig. 3). The basic mesh of an image with anamorphosis abscondita applied is composed of unequal trapeziums, where the distances between the parallel edges are increased (stretched) by the constructive principles of frontal perspective [16–18].

Existing photos of the garden, taken from the adopted viewpoints V1 and V4, were used to create the central projection from the adopted viewpoints (Fig. 2). Confirmation of the visual impression of anamorphosis abscondita was made using the principles of central projection [19]. A horizontal trapezoid mesh is projected onto a vertical view plane both from the point V1 and the point V4 (Fig. 3). The basic geometric idea in creating the illusion lies in the premise that all the points that lie on the same projection ray have the same perspective image [20]. In this way, the existence of anamorphosis abscondita is graphically verified.

The orthogonal mesh is formed using boundary lines between the parts of the garden. The vertical lines of the orthogonal mesh are a central vertical projection of the view planes that pass through



**Fig. 2.** Vanishing point of certain parts of the garden clearly define their inclinations (deceleration and acceleration of linear perspective): from the view point V1 (a); same from V4 (b). Marks A, B, C and D are the parts of the garden under a variety of slopes. VP: central projection of infinity point of parallel lines are parallel to the longitudinal axis belonging to the parts of the garden.



**Fig. 3.** Transformation of the anamorphic mesh which in its base has orthogonal grid on view plane from ocular points V1 (a) and V4 (b); vertical lines 1, 2, 3 and 4 are projections of the vertical view planes, and letters (a, b, c, d) denote the characteristic points on the planes. A, B, C and D are parts of the garden.

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