

# SHADOW AND SCULPTURE – CREATIVE APPLICATION OF LIGHT AND SHADOW GEOMETRY

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**Abstract:** As a sculptor and painter, I have worked for over twenty years in perspective and anamorphosis, engaged in both theoretical and creative research. Geometry has marked my artistic activity: the geometric framework of the perspective, albeit hidden, supports the composition of my artworks, both in large-scale projects and in medium and small dimensions. This research led me also to the creation of some artistic installations on the theme of shadow projection, based on the Euclidean geometric optical model that is common to both visual projection – as the perspective of painters – and light projection.

I present some technical notations and thoughts that accompany the intuition and creative genesis of this type of artwork through my experience. *In the Light of Dante* is the most recent shadow installation currently exhibited at the Cassero Museum of 19th and 20th Century Italian Sculpture, in Tuscany, for the 700th anniversary of the death of the great Italian poet, which occurs this year. Some books placed on a desk in an apparently casual way, cast the shadow of the profile of the famous poet, when they are illuminated by a minute source of light.

An object that projects a shadow other than the object itself creates a gap, a discrepancy between the object and its shadow, and arouses in the viewer a moment of wonder and destabilization. The effect for the observer is that of an immediacy that goes beyond linguistic and cultural boundaries in the face of the natural phenomenon of light.

**Keywords:** Perspective, anamorphosis, optical distortion, sculpture, geometry, shadow.

## INTRODUCTION

As a sculptor I have worked for over twenty years in perspective and anamorphosis, engaged in both theoretical and creative research. During this time period, I deepened my knowledge of optical distortions in sculpture. My reflection on the relationship between the object and the vision, between the two dimensions of the image and the three dimensions of the sculpture led me to the creation of works in a wide range of traditional and synthetic materials, including some experimentation



Fig. 1

of the use of lighting for video installations. This research also led me to create some art work on the theme of shadow projection. On this topic I would like to present a few technical notations and thoughts that accompany the intuition and creative genesis of this type of art work through my experience.

### SHADOW SCULPTURES

My most recent shadow installation, *In the Light of Dante* (Fig. 1)<sup>1</sup> is currently exhibited at the museum Cassero of 19th and 20th Century Italian Sculpture, in Tuscany, for the 700th anniversary of the death of this famous poet who founded the Italian language. Educational activities on the theme of shadow projection will be included in the program.

The shadow sculpture *In the Light of Dante* is a piece made up of some books untidily laid out on a desk and a point of light source. When the light comes on, a lit silhouette of Dante's profile, taken from Botticelli's portrait, is projected onto the opposite wall. The books not only allude to the vast number of written works by the poet himself, but also to the amount of literature which flourished thanks to his work. In this way Dante's "profile" continues to figuratively light the way for the Italian language even today.

At the basis of the construction technique is the Euclidean geometric optical model of light and vision, which has come down to us from the world of ancient Greece.

<sup>1</sup> See *Alla Luce di Dante. Scultura d'ombra*, catalogo della mostra, a cura di Federica Tiripelli, Il Cassero per la scultura italiana dell'Ottocento e del Novecento, Montevarchi, 16 maggio – 28 novembre 2021

For a work dedicated to Dante, this model seemed to be particularly appropriate, being one of the foundations of scientific culture, used for example in ancient astronomical observations with the naked eye.

In this artwork, following this geometric model, light propagates in a straight line from a point source, according to a projection cone. The objects that make up the shadow sculpture are adapted and placed in a specific way to create the lit silhouette of Dante. The farther away the sculpture is from the wall, the larger the shadow cast will be.

This site specific installation was created precisely for the ancient stonewall tower that is found within this museum of Italian sculpture. From an exhibition point of view, all factors of space and material (objects, lit profile and distances) were utilized to create the effects in a certain scenographic and interactive sense. The light, cast by a single-point LED, can be turned on or off with a timer or by the visitor. The visitor can also move about the space within the set up, between the objects, shadow and light source. Paper books are, along with the models of books, made of plaster, all white in color, but of various sizes. Works of art of this nature can also be designed for external exhibition spaces like projecting large shadows on the facades of buildings by utilizing appropriate materials.

An object that projects a shadow other than the object itself creates a gap, a discrepancy between the object and its shadow, and arouses in the viewer a moment of wonder and destabilization. The effect for the observer is that of an immediacy that goes beyond linguistic and cultural boundaries in the face of the natural phenomenon of light.

Minimal is the artist's intervention who, using the technological innovation of LED light to cast well-defined shadows, dialogues with the nature of shadow and light: two fundamental themes of the scaffolding of Dante's journey.

To compose the shadow, defined objects (books) are chosen to maintain their own shape and identity, instead of plain primary materials (paper, fabrics, shapeless matter) and, moreover, because of their metaphorical and meaningful relationship with the cast shadow, thus opening up to the associative, symbolic and metaphorical chain of a story, albeit an evocative one. The artistic ideation here moves along a thread that links contemporary aesthetic sensibility with the tradition of perspective geometry and the practice of perspective, while the light installation takes on a scenic and interactive aspect. This way of proceeding, between Art and Science, seemed appropriate for a tribute to the great poet, whose famous call to "follow virtue and knowledge" resounds, especially in these present difficult times.

In another work of mine, using the geometry of light and perspective projection, a series of numbers are placed in an apparent disorder. When you turn on the light, the numbers cast a shadow spelling out the word Fibonacci. They are all numbers of Fibonacci's series, from 1 to 144. The title is *A Moment of Disorder in the Fibonacci Sequence*.<sup>2</sup> This shadow sculpture was created for Fibonacci Day, November 23rd, 2018, and is now part of Florence's museum of mathematics called the *Giardino di Archimede*.

The first shadow sculpture that I did on the subject of mathematics was for the exhibition *Mate-Milano* in 2004 at the Leonardo da Vinci Museum of Science and Technology in Milan. The theme of the exhibition was mathematics and the city of Milan.<sup>3</sup>

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<sup>2</sup> <https://www.stellabattaglia.com/portfolio/un-momento-di-scompioglio-nella-serie-di-fibonacci/>

<sup>3</sup> <https://www.stellabattaglia.com/portfolio/mate-milano/>



Fig. 2

One year later the *Museo Tridentino di Scienza Naturali* of Trento asked me for a similar work of art for the *Mate Trentino* exhibition (Fig. 2). Once again a series of digits and geometrical objects were hung from the ceiling. When a visitor switched on the light, the word 'Trento' appeared on the opposite wall formed by the shadows projected by these hung objects. The effect was quite astonishing.

Another shadow sculpture was created for the *Magnificent Perspective Apparatuses*, in Palazzo Vecchio, in Florence: some medieval banners and flags cast the shadow of the lion symbol of the city of Florence, called Marzocco (Fig. 3).

Going back in time, in the year 2000, I created the terracotta sculpture *The Temple of Augustus* (Fig. 3). In this work, the temple ruins would project from a specific angle the silhouette of the luminous Augustus of Prima Porta in an installation to celebrate the reopening of the Roman theater of *Bene Vagienna* located near Turin, in northern Italy. Just like in *In the Light of Dante*, the lit profile of the historical figure is outlined by the dark shadow of the objects.

From a technical point of view, the choice of representing the figure as an illuminated silhouette rather than as a dark shadow depends upon the possibility to adapt real objects, without distorting them, in a way to compose the shadow around the outline of the figure or within it.

The outline of the profile in fact becomes distributed along the cone of projection and the size of the object will depend upon the distance from the light source. What is usually referred to as the point of vision of the painter in geometry and in the practice of perspective, has now been replaced by a point of light source. The knowledge of the rules of optical geometry is used to predict the varying relationships between the position of the light (distance and height) and the dimension, position and shape of the objects that make up the silhouette of the shadow. Together, the displayed objects and the shadow that they cast assume a rhythmical articulation determined by the proportional relationship of the perspective geometry.

Just like anamorphic sculptures, the projection cone is imagined not only as a geometric solid, but also as a material solid to be sculpted and modelled, and it forms an invisible geometric scaffolding that supports the compositional elaboration of the work. The installation includes the point of light source, the object, the shadow and the distance between them. All these elements become a unique space that takes on a scenographic character.



Fig. 3

Starting from the same profile, one can choose different objects and different shapes to produce the same shadow silhouette. As I said about *In the Light of Dante* in the works of this nature, I have always chosen to work with well-defined rather than random objects to create the shadow, with the purpose to maintain a metaphorical relationship between the object and the shadow, as well as between the three-dimensional volume and the flat two-dimensional representation.

In fact, this type of relationship between the object and its shadow allows the artist to reinforce the effect of surprise and destabilization: the continuous tie that is usually observed between an object and its shadow is interrupted, but a bond of meaning is maintained in a contradictory way; the shadow profile in fact removes body and consistency, but maintains the flat, dark, yet very similar and recognizable silhouette. The observer, when seeing the shadow cast, is thus directly involved in that empty space of discrepancy that separates the shadow figure from the objects, which are apparently arranged without any relationship with it.

The myth of the origin of painting narrated by Pliny the Elder in his *Natural History* comes to mind.<sup>4</sup> In the ancient city of Corinth, a girl, daughter of a potter, draws the profile of her beloved's shadow. He has to leave, and her desire to keep at least his effigy gives rise to the first portrait in history.

<sup>4</sup> Gaio Plinio Secondo, *Storia Naturale*, Torino, 1988, vol. V, libro 34, p. 473.



Fig. 4

And with this objective I would like to describe the first shadow sculptures made back in 1996 in the context of experimenting with anamorphic sculpture side-by-side with the artist Gianni Miglietta. In those years, one did not yet see works or installations of this nature, but just a few years later, with the spread of the internet, we became aware of research similar to our own, by very few artists from various parts around the world. The number of these artists could be counted on the fingers of just one hand.

In the first shadow sculpture, *The Maiden of Corinth*, you can see some buildings in ruins that allude to the ancient city of Corinth, while in the second, *The Birth of Painting*, a few broken remains of terracotta vases, which bear the traces of time, recall to mind the potter, father of the maiden, protagonist of the myth narrated by Pliny the Elder. When the visitor turns on the light, the shadow of a maiden is cast to evoke the one who first traced the outline of the beloved's shadow (Fig. 4).

And here the sense of the portraiture emerges, as a simulacrum against the oblivion, which Pliny himself highlighted about portraits sculpted in marble, a material considered to be durable and resistant to the ravages of time.

### SHADOW SOLID

My interest in the shadow projection is not expressed only in these types of sculptures where the shadow is the evident protagonist, but it supports all of my creative elaboration starting from the first intuition of anamorphic sculptures up to the works centered in various ways on the relationship between the three dimensions of the objects and the two dimensions of the image, which has characterized my activity as an artist up until now.

In the first period of this research, during the practice of designing and material realization of my sculptures, in fact, different moments of work alternated continuously: some moments of modeling in clay, which were animated by the need to give body to an imagined figure; moments of design drawn with a ruler and square in plan and elevation to evaluate dimensions and volumes, or to choose the visual angle, or even to choose between the different deformations that a design could assume depending on the plane of projection; up to the moments of projection with point sources of light to see, directly with the eye, the perceptual impact of my project (what I was measuring and imagining) on the observer and his relationship with space. This is

for me a fundamental aspect of the realization of a perspective artwork (and I think it still is, although a lot of work can be done with computer programs), considering the fact that, although it can be represented with drawings and elevations, and even with reduced-scale models, the effect on the observer is not completely predictable, in the sense of direct, emotional and suggestive involvement. In those moments of perspective design, the point of view, the point of geometric projection and the point source of light alternated continuously at the vertex of the cone of projection. With this “triad” the painters’ perspective constituted a real tool rich in the possibility of giving shape to what one imagined, which, beyond all, is the true purpose, for an artist.

I used to model the first anamorphic sculptures according to my concept about geometric shadow solid. It was imagined as a kind of ‘solid’ that is defined by visual rays, or light rays, with the eye or a point source of light as the vertex of the projection cone. This ‘solid’ may be seen as filled by the succession of shadows cast by an object, or by its perspective drawing, on all of the planes and surfaces intersecting it. It may be considered the material precipitate of all the possible projections of shadows; hence its contradictory name, ‘shadow solid.’

The possibility of an infinite variety of section planes of the visual pyramid had fascinated me to such an extent that the idea of the shadow solid became a working tool for the conception of the artwork, so much that I had tried to experiment with different materials to which one can give shape, to arrive at clay (the sculptor’s chosen material) with a free and impulse modeling, but mentally governed and subjected to these planes and hidden sections.

In this way I had experimented with the application of solid shadow on different subjects such as figures, faces and images of architectural spaces. Through the latter, the way was opened to the concept of perspective scenography, so full of interesting ideas and compositional possibilities, since it involves the space where a visitor can move not only around a work, but also through the work, becoming part of the work itself. And thus was born an experimentation of clay models on the theme of some little cities and gardens.

The space of the perspective scene turned out to be the most preferred dimension for me, suspended between image and regular architectural space, like a fantastic world that is completely realistic, but made up of contracted and irregular shapes. Thus I rediscovered that same fascination that had bewitched me as a child when I saw the theatrical machinery on stage during my own first performance, the first of my artistic activity, which then led me on the path to work with plastic arts.

I was fascinated by the typical characteristics of the perspective scenography, that way in which the perspective representation is deformed by being projected on the shortened volume of the scene, while the actor, who naturally keeps its dimension unchanged, reveals the incongruity and fiction of the perspective, when he moves back and forth on the stage.

This thought also opened up the possibility of ‘think outside of the box’ by making a character scenographic or by compressing an architectural space as if it were a figure of a bas-relief. I could imagine overcoming conventional limits by dragging within this dimension not only the architectural spaces of the scene, but also the objects, chairs, tables, accessories and the characters themselves. Thus I accessed the dimension of the bas-relief.

In the perspective bas-relief, both the architectural space and the figures are deformed in a more radical way, to reconcile real volume with fictitious volume. The bas-relief gives back to the drawing only a little of the relief that belonged to the

natural object, thus obtaining a three-dimensional figure, yes, but with a 'contracted' volume compared to the natural one. This involves a delicate and complex operation of distorting the shapes so that the illusion of the image is both preserved and strengthened by the relief.

In this sense, each fragment of each sculpture could be treated as a bas-relief. It could have been modeled with a greater or lesser degree of overhang.<sup>5</sup> The outline of the drawing remained unchanged, while the modulation of the relief could be orchestrated.

The light could now also take on another role, that of revealing the relief. Illuminated by natural light, the shapes modeled more or less in relief produced more or less wide shadows, with a more or less contrasting chiaroscuro effect. The range of colors could be added and the baggage of the perspective artist seemed clear and complete.

The triad "eye-light-geometry", to which I would now add the artist's hand to draw and model, seemed to me to open up possible ways to relate and exchange, in an intertwining manner made up of multiple directions between those that are defined, historically and technically as the fields of application of perspective. What fascinated me the most was the contamination and the overcoming of the limits of each of these sectors, since they all communicated with the same language, that of perspective geometry, vision and light. The continuous link that united the drawing (two-dimensional), the volume of the object (three-dimensional), the point of view / point of light / point of geometric projection, together with the distance between them, could be modulated in a multiplicity of ways, as a single element.

Both Gianni and I were fascinated by the vision and shadow projection and were therefore experimenting with the various proportionality related to distance, so that the composition of our works was based and articulated on the harmonious, proportional criteria of perspective projection.

The use of light was not only a technical moment of verification, but it also became a moment of enrichment of what could be imagined mentally or by drawing.

In those years, we dedicated ourselves to this research in our home-studio located in the south of France. There we explored the application possibilities of anamorphosis in its various forms, going from flat surfaces to complex ones, up to sculpture and to creating shadow sculptures.

## INSTALLATIONS AND SCULPTURES

The experiments we did were supported and accompanied by readings on the themes of perspective and anamorphosis. It was only in the following years that we were able to deepen our historical knowledge, especially following the exhibition *In the Sign of Masaccio. The Invention of Perspective*, (Uffizi Galleries, Florence, 2001) edited by Museo Galileo.<sup>6</sup> For this exhibition we created two large anamorphic installations, making use of our previous knowledge and experience.

At that moment the projection of the shadow, and the practice we had of it, had proved to be a very useful tool, due to its reliable precision, which had helped us

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<sup>5</sup> Several years later I had the opportunity to study some bas-reliefs by Donatello, during their restoration conducted by the Opificio delle Pietre Dure, in Florence. It was particularly exciting for me to come into direct contact with the artworks of the master of perspective bas-relief and discover his inventiveness and his subtle artifices of this art that belongs to both painting and sculpture.

<sup>6</sup> See *Nel segno di Masaccio. L'invenzione della Prospettiva*, catalogo della mostra, a cura di F. Camerota, Firenze, 2001, p. VI.



to quickly solve the problems posed by the request to produce a 30 meters long anamorphosis in a very short time.<sup>7</sup>

The various commissions on behalf of the museum along with the request to design and create an educational activity on the topic, allowed us to structure and organize our knowledge, thanks also to the dialogue with the museum's scholars.<sup>8</sup>

It was again the study of shadow projection, and the thought of an alternation between the point of light projection and the point of view at the vertex of the geometric projection cone that allowed experimentation on the theme of the portrait, risen from the need to respond to a particular request for the exhibition *The Mind of Leonardo. The Universal Genius at Work*, that was to be held in the Uffizi Galleries, in 2006. I had to create some “three-dimensional models” – that is, sculptures – after Leonardo da Vinci's preparatory drawings for the characters in the *Last Supper*.

For obvious reasons I had chosen not to go into any interpretation, but simply, in the most neutral way possible, to give three-dimensional volume to the drawings. I turned to the studies that Leonardo himself had done on the subject of portraiture and, in particular, the portrait of shadow.<sup>9</sup> I modeled in clay so that the shadow profile of the character corresponded as closely as possible to Leonardo's drawing (Fig. 5).

It was a very unique experience to model clay in dialogue with the projection of shadow which, when escaped onto the material, can take on any shape until it finds its place in accordance with the design. The fundamental role that the point of view had played in my work of three-dimensional perspective distortion and in my studies of perspective thus became meaningful in a concrete and operational way.<sup>10</sup>

After that experience, I simply wondered if the operation that the painter traditionally makes by retracting his model from a certain point of view, could not be done in reverse to give volume back to the drawn portrait or photograph.

It was a simple geometric thought. One needed just to have it clear in one's mind: Bijection, in geometry.

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7 <https://www.stellabattaglia.com/portfolio/anamorfoosi-di-un-dodecaedro-vacuo/>

8 We conceived the educational workshops on the basis of Leonardo's drawings and notes on the theme of the relationship between vision and perspective representation, on his studies about the visual pyramid and the projection of shadows, as well as on his studies about the perspective distortions and the aerial perspective. For the exhibition *The Mind of Leonardo: The Universal Genius at Work* (Florence, Uffizi Gallery, Florence, 2006) we had also reconstructed some models for the section dedicated to “The Science of Painting”. The investigation into the relationship between perspective of the philosophers and the painters' perspective, as well as the study of the relationship of ancient skiagraphy with drawing and perspective drawing (see for exemple A. De Rosa, A. Sgrosso, A. Giordano *La geometria nell'immagine. Storia dei metodi di rappresentazione, Dall'Antichità al Medio Evo*, A. De Rosa, UTET, 2000, 52–58; F. Camerota, *La prospettiva nel Rinascimento. Arte, architettura, scienza*, Milano, 2006, 14–21, 263–270), became part of the text of the workshop, which was conceived as a theatrical canvas. In this way it was possible to offer a scientific and historically founded presentation, which is made dynamic by a series of direct experiences that use the natural phenomenon of light and vision, starting from a Camera Obscura. Some images taken from the Renaissance treatises of perspective have also been included, to support the practical operations that take place in the workshops.

9 It seems that Leonardo himself used the shadow projection as demonstrated by some of his drawings where the profile is slightly larger than natural size (C. Pedretti, “Il tema del profilo o quasi”, in: *I Leonardeschi a Milano: fortuna e collezionismo*, Atti del Convegno internazionale, Milano, 1990, a cura di M.T. Fiorio e P.C. Marani, Milano 1991, 17–19). This technique, moreover, evokes that pyramidal law applied by Leonardo in many fields of his research, from his studies on shadow to those on the visual pyramid and the perspective.

10 S. Battaglia Miglietta, “Interventi d'artista”, in: *La mente di Leonardo. Nel laboratorio del genio universale*, catalogo della mostra, a cura di P. Galluzzi, Firenze, 2006, 373.

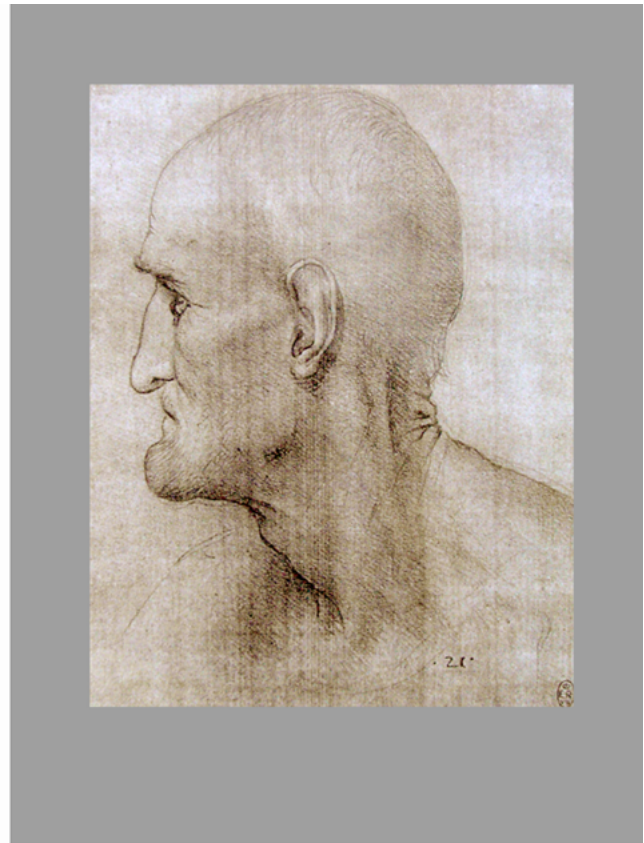


Fig. 5

It seemed the most impersonal and least interpretive thing an artist could imagine, but this is how my sculptures with video projection were born: the first of which *Galileo!*, was created for the inauguration ceremony of the exhibition *Galileo: Images of the Universe from Antiquity to the Telescope* (Palazzo Strozzi, Florence, 2009) (Fig. 6). Later a more strictly artistic one was presented in various exhibitions and art fairs: *Fra-Ma-Pi, fratelli*. Here the game of glances between two young brothers and a sister is captured in a moment of everyday life.<sup>11</sup>

The final result of the simple application of one-to-one correspondence can be summarized with the following steps:

- a sculpture actually modeled starting from living models with the proper technical skills of the language of sculpture. The children came to my studio so that I could model their portraits manually (not mechanically with a cast or laser scan).
- a photograph that captures a moment of life of the chosen characters:
  - in this case the game of glances suggests the affective and playful relationships and the emotional tensions between the three siblings, in an age group that goes from childhood to adolescent threshold.
  - the light positioned in the original place of the photographer.
- a short video montage in which the bright image of the siblings perfectly matches up with their plaster portraits only for an instant and then continues in the movement of a continuous light vibration.

<sup>11</sup> <https://www.stellabattaglia.com/portfolio/fra-ma-pi-fratelli/>

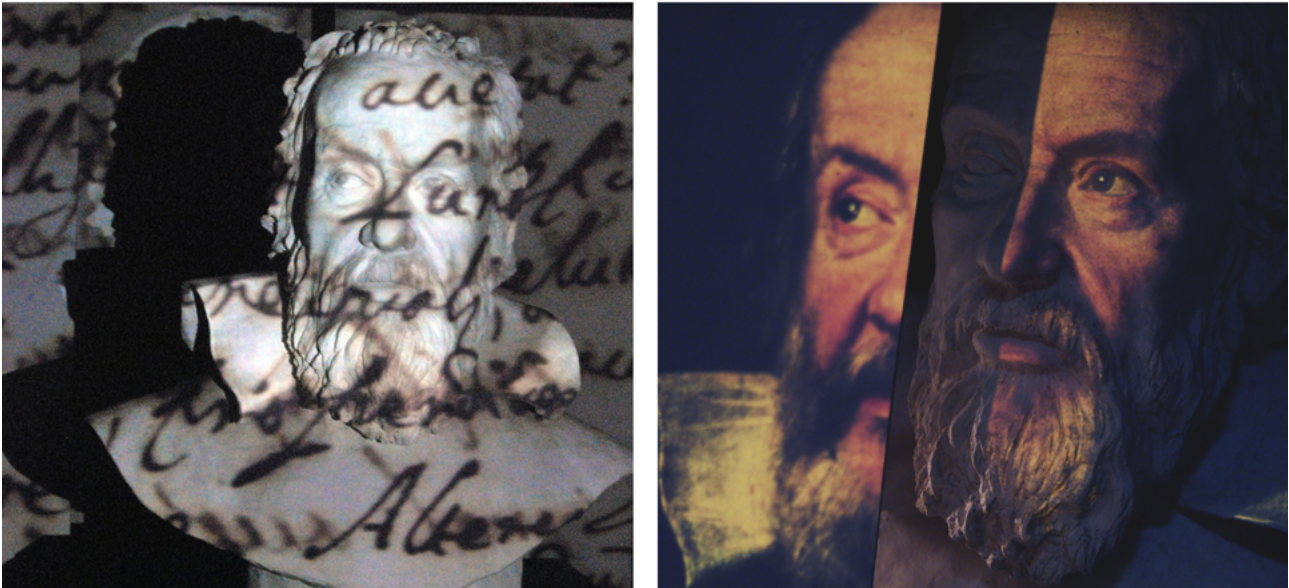


Fig. 6

- Total sum effect:  
a contemporary polychrome portrait that brings together the plasticity of traditional portrait, color of polychrome sculpture, photography and movement of the video movie.

This may all seem like a complicated reasoning, but in reality it was for me just an immediate vision, and then a lot of work to achieve it.

The expressive effect for the beholder:

anyone who enters the dimly lit room is faced with capturing a moment of life of three siblings caught in their affective relationship, but open to a dialogue with the observer thanks to the gaze of the youngest child turned to the public.

The figures are not posing and are rendered vivid by a luminous image that assumes the corporeity of the material, and by the sculpture which “wears” the true colors of life, colors which are not painted, but impalpable like light, colors present with the naturalistic force of photography, but fleeting in motion.

A moment of a very evocative story, almost emotionally speaking, which takes place in the short time of the flow of the video movie.

With regards to the actual sculpture in more traditional terms, once again this texture of thoughts that intertwines the material volume of the object with the flat contour line of the shadow and the drawing, or with the volatile – virtual – images of the anamorphosis, led to the birth of a sculpture that is not a true and proper anamorphosis (Fig. 7).

I was working on the figure of a seated woman with a live model in my studio and, to model her in clay, I walked through what can be called the labyrinth of points that formed the beautiful position she had assumed.

It suddenly seemed to me that I almost tangibly perceived the difference between the drawing that I had made of her before on a sheet of paper, and the place of those same lines on the real body of the young woman placed within the space of the room.

Once again it was as simple as it was fundamental: I was wondering about the difference between orthogonal projection (the realm of measurement) and perspective projection (the world of visual appearance and of the plane of drawing). Really nothing new.



Fig. 7

But that difference between conical projection and parallel projection for a moment seemed to have touched it with my own hand, with an almost speaking-type of evidence. I saw it! That emptiness, that passage that cannot be done, I want it. I want to materialize it, I want to show it!

And so after a series of attempts, with molds and counter molds, I managed to cast in bronze the line that separates the part in shadow from the part in light of the body of a young woman illuminated from behind in a room. The shadow outline was equivalent to the line drawn in the drawing of the same figure, when the eye is positioned in the place previously held by the light source. This sculpture is not even an anamorphosis, it is only the drawn outline of a woman who was there and who left that empty space.

“It means then – wondered Gianni out loud – that there is a moment in the work of an artist sculptor in which he creates by denying himself as an observer? There is no eye in parallel projection... the sculptor denies himself to reassert himself as a three-dimensional object, present in space... Of course this fact dialogues with the perceptive fact, but it is fundamental that we find something denied and affirmed at the same time.”

The echo of the ancient discussion on the comparison between the art of painting and the art of sculpture resounded, if not only the tactile aspect of sculpture is emphasized, but also the visual one.

It was precisely the deepening of the visual aspect of sculpture that then led me to studies on the perspective of some Renaissance bas-reliefs and on the proportions and optical corrections of ancient sculptures, a topic on which I am still working on behalf of the *Opificio delle Pietre Dure*, for the occasion of the restoration of the ancient bronze sculpture *Vittoria Alata* in Brescia.<sup>12</sup>

## MIRRORS AND MEASURE OF TIME

In the same time frame, Gianni was conducting studies on catoptrics and on anamorphosis with mirrors, fascinated by the double that the reflected image represents. Anamorphosis with all forms of mirrors (flat, cylindrical, pyramidal, conical, up to the spherical mirror that has become his signature figure) has been the subject of his investigations, models and creations where light was the protagonist. The reflection of light rays was accompanied by the geometric design of the angles of reflection and the calculations to choose the surfaces and the deformation of the image.

The geometric design of anamorphosis with spherical mirrors was the topic of a seminar with the students of the Descriptive Geometry course within the Faculty of Architecture in Florence. For several years we had the opportunity to work with this institution. It was important for the students to physically and visually experience the principles of the perspective geometry technique. Furthermore, we had expressly built some models to show the link between geometric construction of perspective and the natural phenomenon of shadow projection.

This is a complex topic, and so very rich in interest that we have also studied and developed in a didactic workshop expressly conceived for Museo Galileo aimed at secondary school students, retracing the steps of Leonardo da Vinci's studies for a scientific foundation of the practice of perspective and painting.<sup>13</sup>

Light has proved to be one of the most precise and reliable tools, in our personal experiences of creation, with the addition of some tricks and small corrections necessary to the needs of the eye. With this method of alternating between eye, light and geometry, we were able to effectively design a "quadraturist" anamorphosis in the room of Museo Galileo dedicated to didactic activity on perspective,<sup>14</sup> and then create an anamorphosis artwork with a spherical mirror on the theme of armillary spheres.

The interest in shadow geometry that animated our research could also find application in another field, that of the measurement of time. We had just finished the work for the exhibition about Galileo, for which we had prepared several models, including some on celestial projections, with transparent spheres and points of light. Other models of sundials had been built by Gianni for the educational workshops,

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12 S. Battaglia, "Vittoria Alata. Proporzioni e Composizione della figura. Prime indagini", in: atti del convegno *Il restauro dei grandi bronzi Archeologici. Laboratorio aperto per la Vittoria Alata di Brescia*, a cura di F. Morandini e A. Patera, Firenze, 2020; S. Battaglia, "La Vittoria Alata. Proporzioni e apparenza visiva" in *La Vittoria Alata di Brescia. Non ho mai visto nulla di più bello*, a cura di F. Morandini e A. Patera, Brescia, 2021.

13 Part of this work was presented in the exhibition *Beyond the Senses*, which was dedicated to our works, in the context of the *Festival della Scienza di Genova*, at Palazzo Ducale in Genoa, in 2008.

14 Regarding the method of making quadraturist paintings by specialized painters, the debate among scholars is very articulated, in particular whether the projection of the shadow was actually used. See for example A. Bosse, *Pour pratiquer la perspective sur les surfaces irrégulières*, 1653, p. 42, pl.2; L. De Carlo, L. Carlevaris, D. Di Marzio, "La sala clementina in Vaticano tra manierismo e barocco" in *L'architettura dell'inganno. Quadraturismo e grande decorazione nella pittura dell'età barocca*. Atti del convegno internazionale di studi, Rimini 2002, Firenze 2002, p. 142; B. Aterini, *Spazio immaginato e Architettura dipinta*, Firenze, 2012, p. 42.



Fig. 8

including a model to illustrate the principles of the astrolabe. The model was composed of a transparent Plexiglass sphere and a flat surface, so that visitors could see, in a concrete object, the principle of projecting the domed celestial vault onto a flat plane, which is at the base of the fascinating instruments exhibited in the museum's display cases. Thus via these models the visitors could be visually introduced to this complex ancient instrument used for measuring time in a specific geographical place.

Our thoughts and conversations continually shifted from conical to parallel projection, from projection with a single point light source to a projection with several LEDs positioned to represent parallel light rays. We often went back to Leonardo's thought that the sun can never see the shadow that he himself generates by illuminating the object.<sup>15</sup>

The fascination of a space that is pervaded, punctuated and rhythmically filled by rays of light occupied our minds for long periods. In this context, Gianni turned to the creation of sundials including a monumental sundial for the external spaces and a catoptric sundial inside a south-facing room of Museo Galileo: here the lines of the path of sunlight are deformed by the ancient ribbed vaults of the ceiling and take on the appearance of an anamorphic design<sup>16</sup> (Fig. 8).

Lines, or better yet bands of shadow and light, were the subject of other projects including pieces of jewelry. Even in such a small decorative object, I considered the relationship between a wavy ribbon and its shadow. The earrings are imagined as a fragment taken from the wider movement of a striped fabric. They are made in

<sup>15</sup> "Nissun luminoso non vide mai l'ombra da lui figurate", Leonardo da Vinci, *Libro di Pittura*, ed. Giunti, a cura di C. Pedretti, Firenze, 1995, II, parte terza, 467.

<sup>16</sup> The catoptric sundial of Museo Galileo was created in collaboration with the gnomonist S. Barbolini.

black colored resin to symbolize night; or in luminous silver to symbolize light and they are imagined in order to adorn the female face.

Which brings us back to the girl from Corinth and the shadow portrait from which this discourse began on the intertwining of connections and associations between light, shadow and geometry that can still accompany the creative process today.

The great fascination that the shadow has always exercised on human beings, enriches the work of the vast cultural discourse regarding the theme of shadow, beyond perspective geometry in the strict sense.

If it is true that in the contemporary panorama the knowledge of the nature of light has profoundly changed from the time of the ancients, what still fascinates me as an artist is the astonishment that continues to be aroused by the natural phenomenon of cast shadows in such a primordial, direct and immutable simplicity.

And if it is true that it is the light that casts the shadow, to have a portrait you always need the intervention of a maker who has the desire to trace the outline; otherwise, when the light is turned off, the effigy disappears.

Translations by Karen Marie Giacobassi

Photographs *In the Light of Dante* by Donato Spadola

### ILLUSTRATIONS

1. S. Battaglia, *In the light of Dante*, shadow sculpture for the 700th anniversary of the death of the poet, Cassero Museum of 19th and 20th Century Italian Sculpture, Montevarchi (Tuscany), Italy, 2021, mixed media (paper books, plaster books, LED light) cm 80 × 75 × 45.
2. S. Battaglia, *Mate-Trento*, shadow sculpture for the exhibition *Mate-Trentino, percorsi matematici a Trento e dintorni*, Museo tridentino di scienze naturali of Trento, Italy, 2006, mixed media, cm 150 × 90 × 35.
3. On the left: S. Battaglia, *Il Marzocco*, shadow sculpture for *Magnificent Perspective Apparatus*, Palazzo Vecchio, Florence, Italy, 2002. On the right: S. Battaglia and G. Miglietta, *The Temple of Augustus*, shadow sculpture for the reopening of the Roman Theater of Bene Vagienna, Italy, 2000, mixed media, cm 80 × 80 × 60.
4. On the left: G. Miglietta, *The Maiden of Corinth*, shadow sculpture, 1996, mixed media, cm 110 × 65 × 50. On the right: *The birth of painting*, 2008, mixed media, cm 68 × 50 × 32.
5. On the left: S. Battaglia, *The Apostle Simon*, sculpture, plaster life size, after the Last Supper and preparatory studies of Leonardo da Vinci, for the exhibition *The mind of Leonardo. The universal genius at work*, Uffizi Gallery, Florence, Italy 2006. On the right: *Leonardo da Vinci (or copy after)*, Royal Collection, Windsor 12550, Preparatory study for the apostle Simon.
6. S. Battaglia, *Galileo!* plaster bust, scenographic sculpture with video projection, for the exhibition *Galileo: Images of the Universe from Antiquity to the Telescope*, Palazzo Strozzi, Florence, Italy 2009.
7. Stella Battaglia, *Elisa*, sculpture, bronze, life size, 2012.
8. G. Miglietta, *Catoptric Sundial*, Museo Galileo, Florence, Italy. In collaboration with the gnomonist S. Barbolini.

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Стела БАТАЉА

#### СЕНКА И СКУЛПТУРА – КРЕАТИВНА ПРИМЕНА ГЕОМЕТРИЈЕ СВЕТЛА И СЕНКЕ

Овде су приказани неки моменти креативног процеса стварања сеновитих скулптура, почевши од уметничког дела У светлу Дантеа, које је тренутно изложено у Музеју италијанске скулптуре 19. и 20. века "Касеро", у Тоскани, поводом 700. годишњице смрти великог италијанског песника. Ова инсталација у сенци састоји се од неколико књига неуредно положених на сто и фокусираног светлосног извора. Када се светло упали, упаљена је силуета Дантеовог профила, преузета са Ботичелијевог портрета. пројектована на супротни зид. Објекат пројектује сенку коју сам приказани објекат нема, стварајући јаз, несклад између објекта и његове сенке, и буди у посматрачу тренутак изненађености и дестабилизације. Ефекат за посматрача је непосредност која иде даље језичке и културне границе пред природним феноменом светлости. Сврха овог излагања је да истакне како се у уметничкој пракси перспективе перспектива геометрије и геометрије вида и светлости, које се заснивају на заједничком Еуклидовом геометријском оптичком моделу, може да пружи уметнику три алата, не само за досезање знања и планирања, али и за материјалну реализацију. Моје уметничко истраживање на тему анаморфозе и перспективе изобличења, која се развијала током дужег временског периода и са теоријске и са креативне тачке гледишта погледа, довело је до стварања уметничких дела рађених у различитим техникама и материјалима, од скулптура у теракоти и бронзи, до керамике, до цртања и сликања, укључујући инсталације са светлом и сенком.

**Кључне речи:** перспектива, анаморфоза, оптичка дисторзија, скулптура, геометрија, сенка.