MUNI
FI

Introduction to Visual Communication

PV 123

1. PERCEPTION OF SPACE

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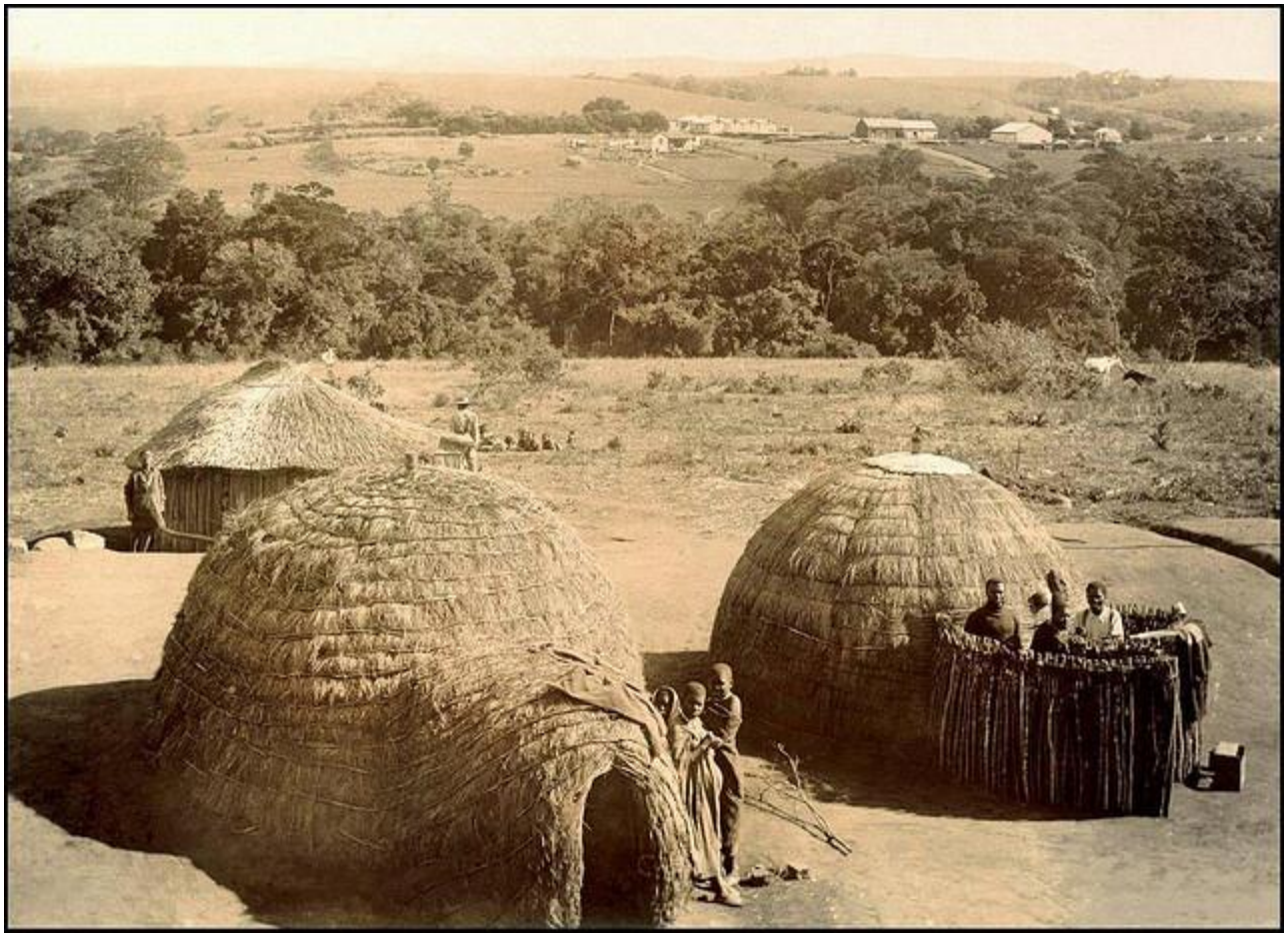
1 - 13

Environmet

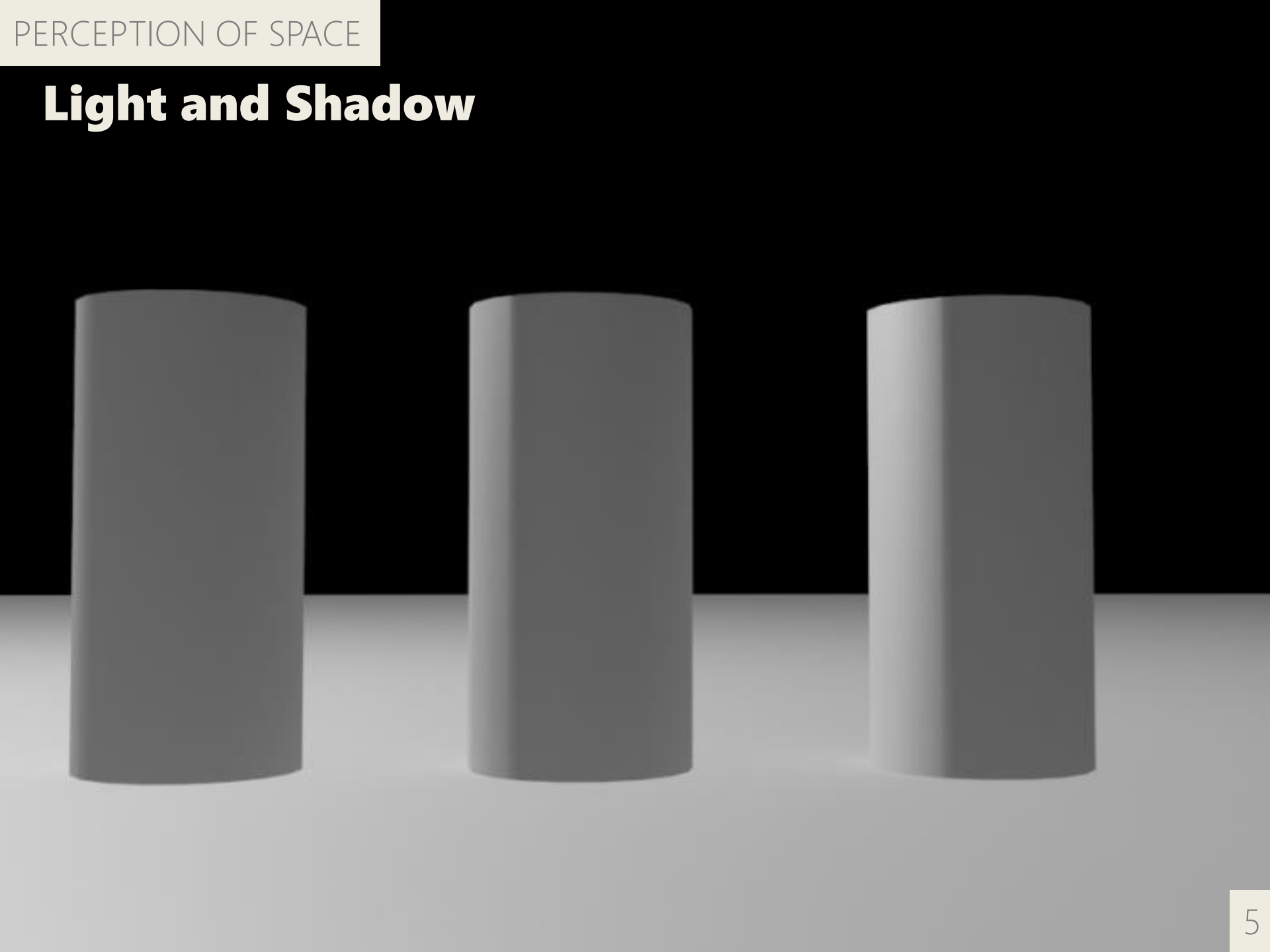
In an open space, where we perceive, for example, the horizon, we have a feeling of space. The description of space and its perception is reflected in language (atmospheric phenomena, types of clouds, etc.) and in artistic creation (sharp light and shadows probably shaped geometric approaches in the sculptural creation of the African continent.)

Environmet

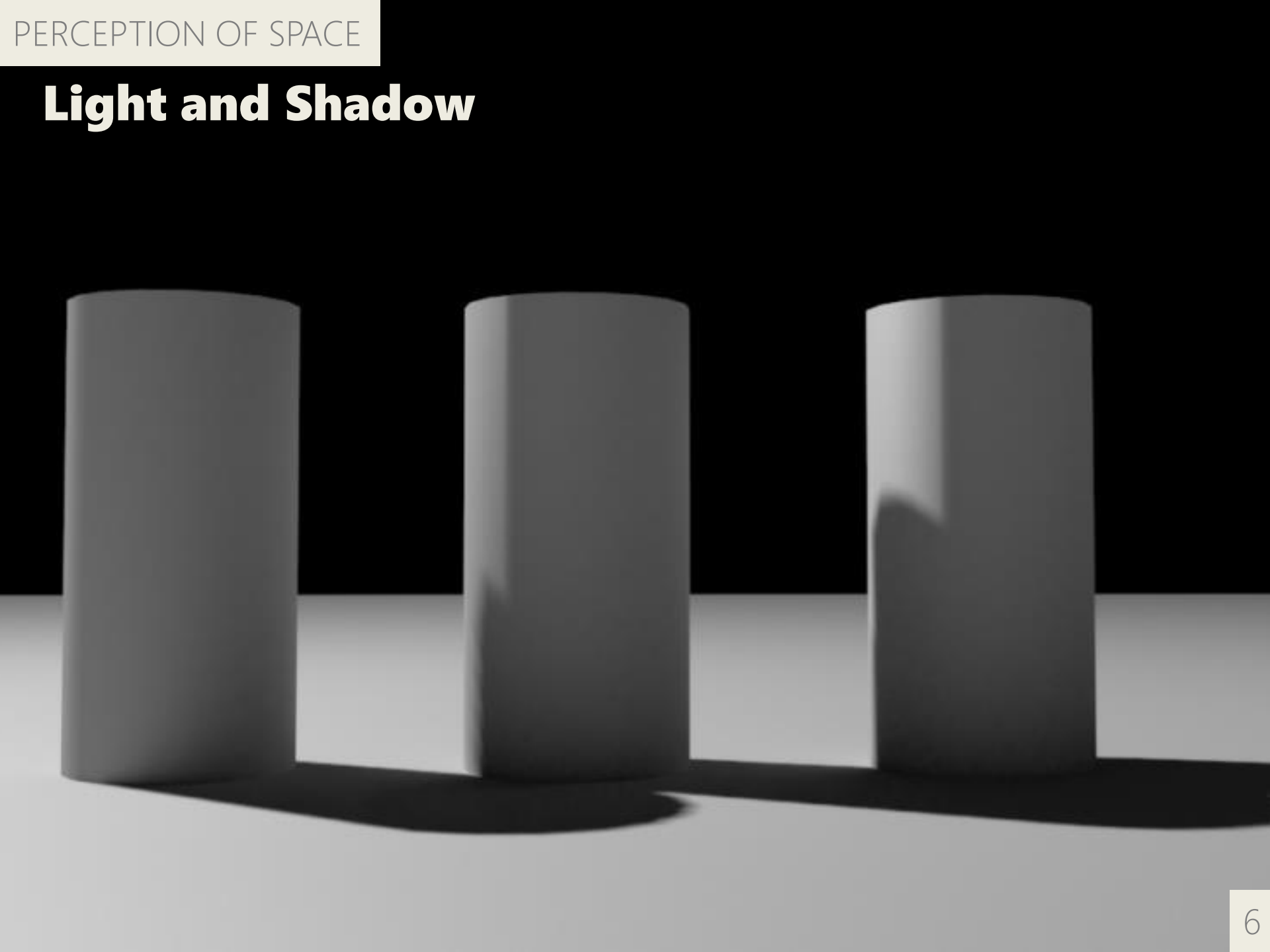
Zulu (South Africa) live in an environment where elements of perspective are lacking: angles and edges. The houses are round, the doors and objects they have rounded shapes. Even the furrows are plowed into curves.



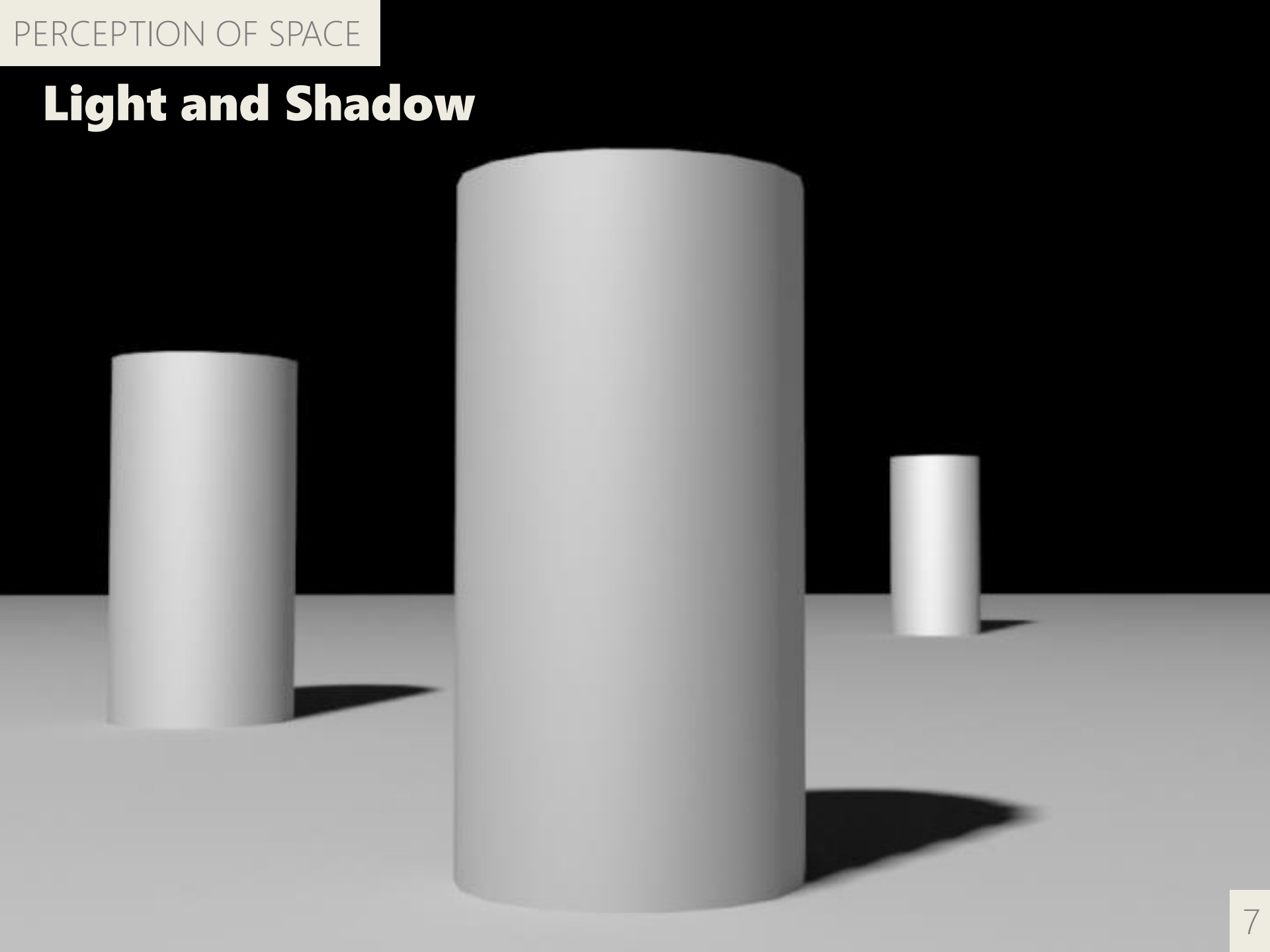
Light and Shadow



Light and Shadow

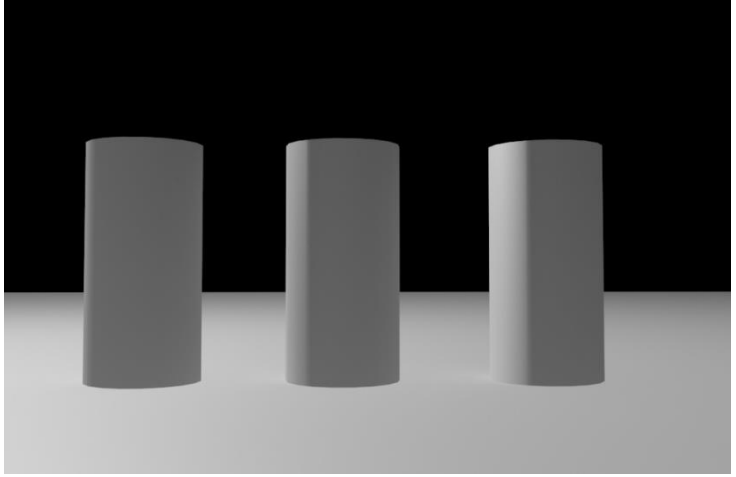


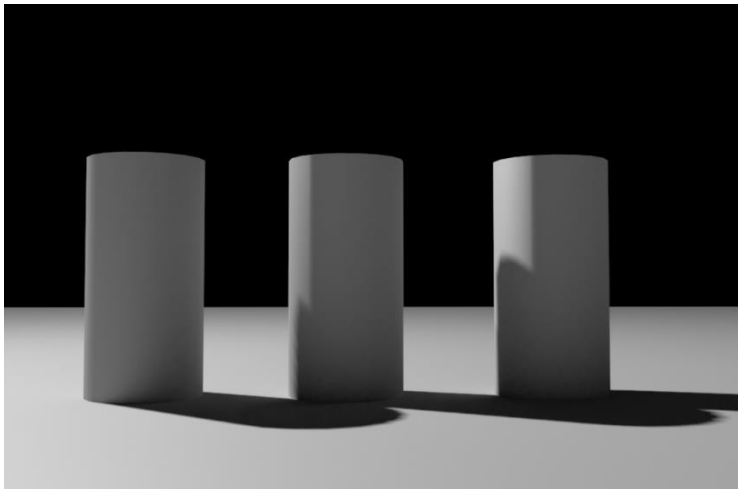
Light and Shadow

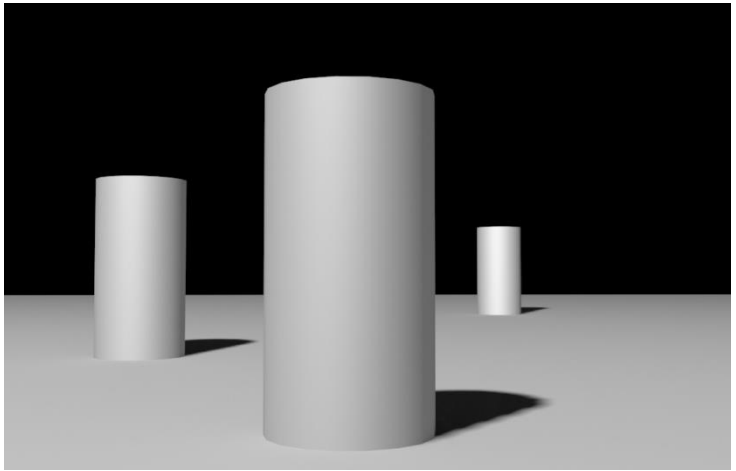


Light and Shadow

We percieve space thanks to light and shadows, we can understand the relations of objects on space, the position of the light source

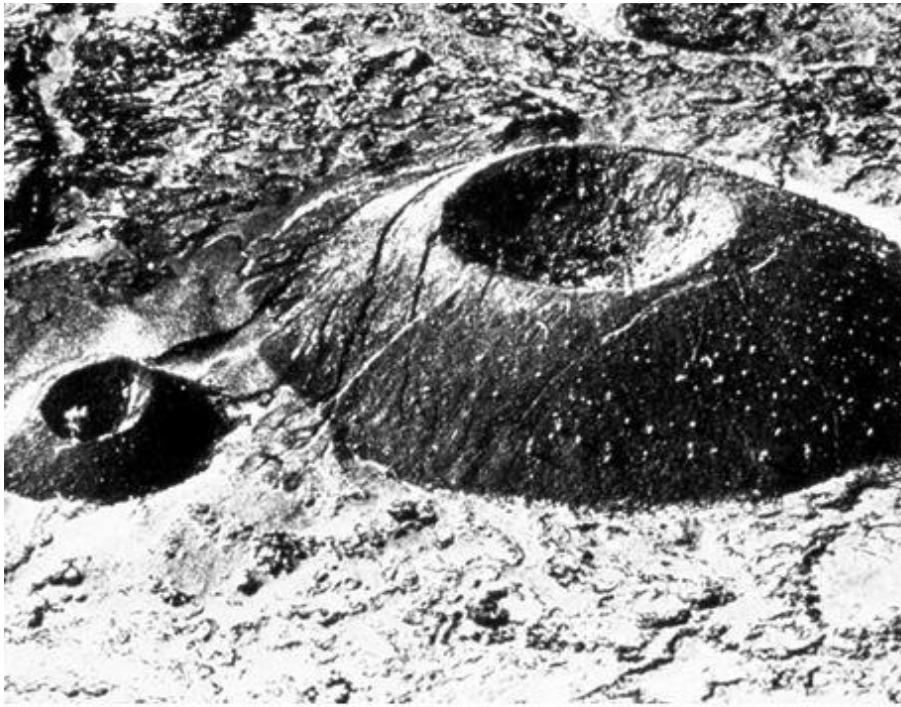






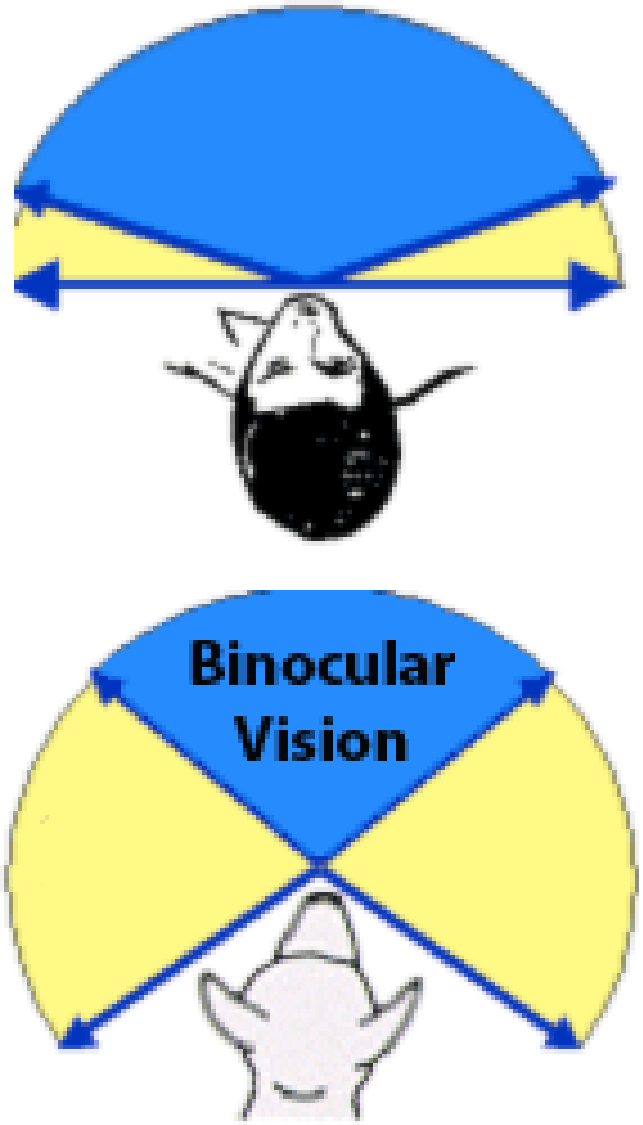
Light and Shadow

Světlo a stín je pro pochopení prostorových vztahů objektů a modelace povrchu objektů klíčový.



Binocular Vision

Because our eyes are settled side by side, we perceive the depth of space.



Binocular Vision

In 1838 (one year before the invention of photography!) Sir Charles Wheatstone at the Royal Society of London lectured on the topic of binocular vision. He described how thanks the offset of the eyes is perceived by two different ones images that compose to create the illusion of depth.

Charles Wheatstone

Binocular Vision

Wheatstone later applied his theory in of the invention of the Viewmaster stereoscope, 1860.

Charles Wheatstone

Stereoscopy

Methods of 3d projections:
http://www.youtube.com/watch?v=IYm3BmnyVrg

anaglyph

2. PROPORTION

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15 - 18

Scale
size relative to the original.

Proportion
Mutual relations of volume, size and form of details in the whole.

Canon
Established proportional principles.

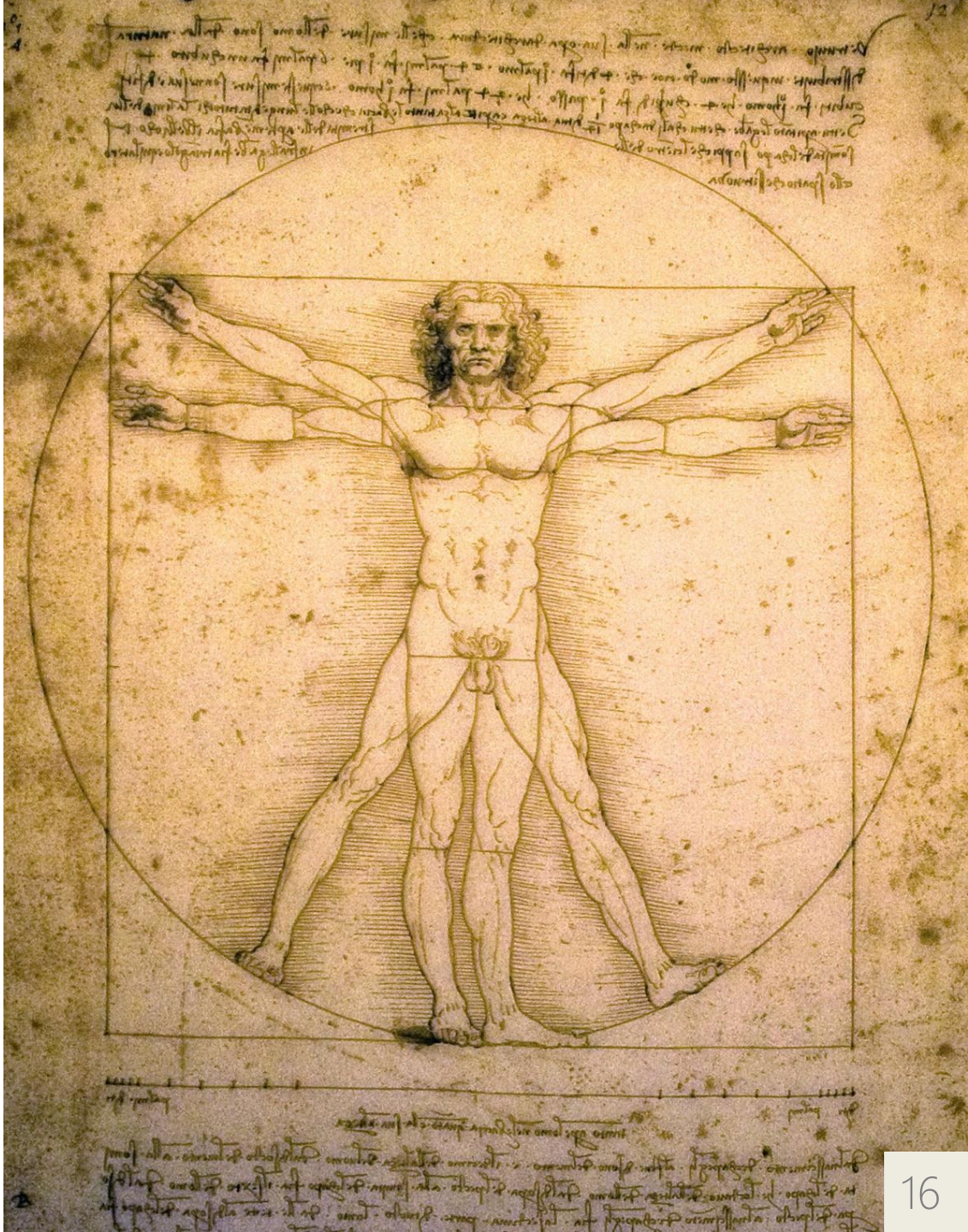
Scale

Proportion Canon

Roman builder **Vitruvius** 1st. century B.C. determined the proportions of the architecture. He wrote 10 books about architecture The concept of numbers, geometry and dimensions. His work is influenced by anthropology, and therefore he also mentions the square and the circle as two basic forms in which one can portray an upright man (the so-called Vitruvian man).

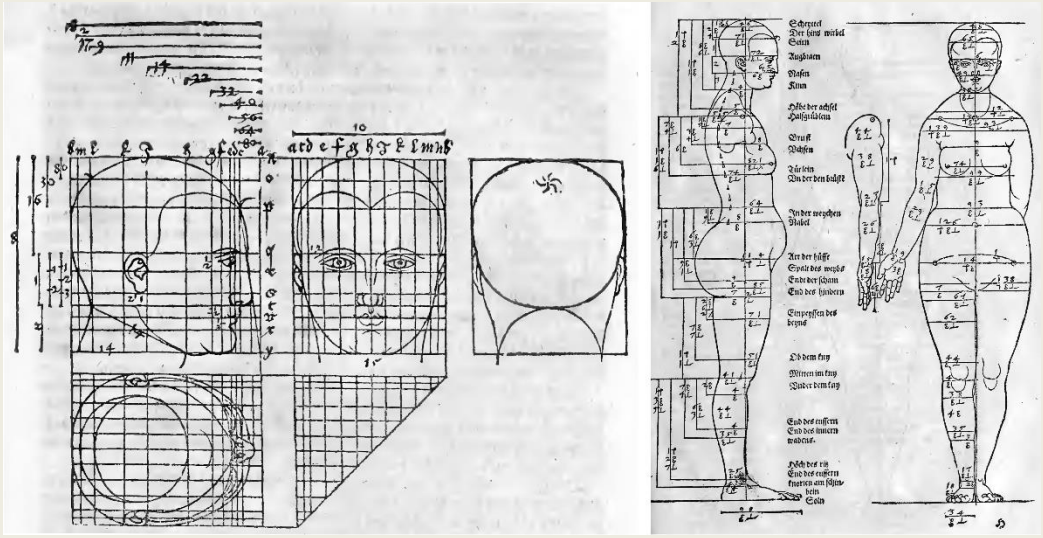
Leonardo da Vinci
Vitruvian Man

The Beauty of Diagrams: Vitruvian Man:
https://www.youtube.com/watch?v=tBdEr2-C-U4

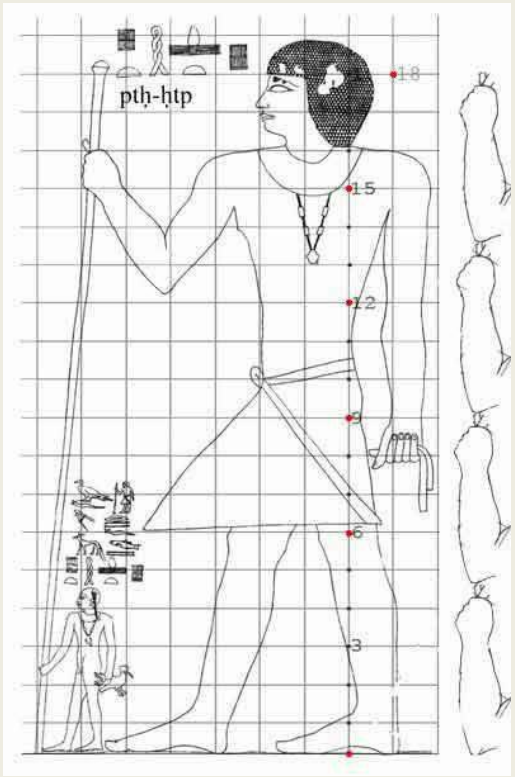


Canon

Module - unit - certain value - size, the distance that can be multiplied in total, thus creating a rule. Vitruvian Man - head 1/8 of body height.



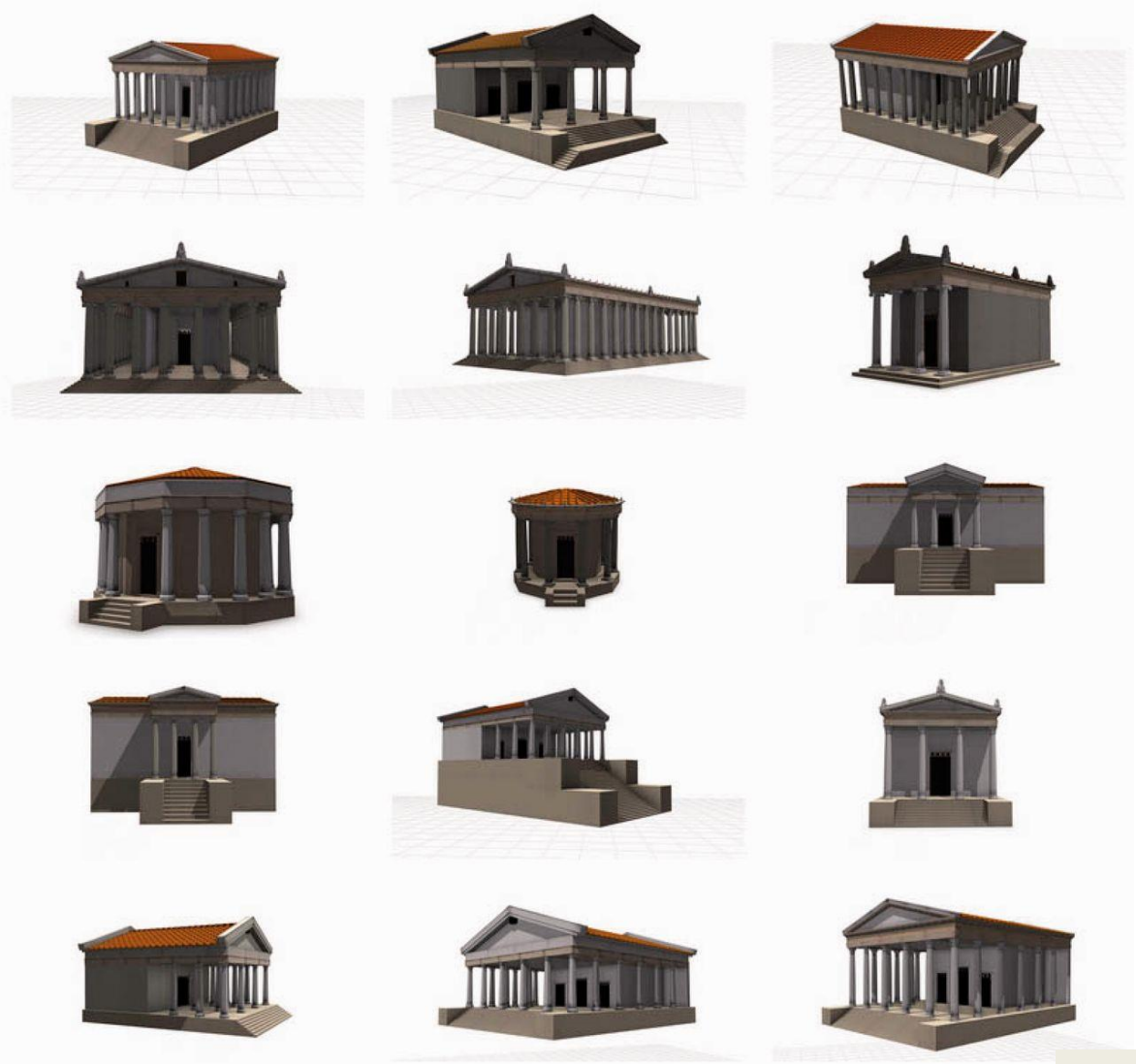
Albrecht Dürer (147 - 1528) –
examination of the average values of the proportions of the human body.



Egypt - the unit is ankle distance from the ground.

Procedural Generative Architecture

Language of Shapes (Shape Grammar for Procedurally Generating) based on the theories of Vitruvis, became the basis of generated classical Roman buildings.



https://www.fi.muni.cz/~liarokap/publications/VAST2012.pdf

3. LINEAR PERSPECTIVE

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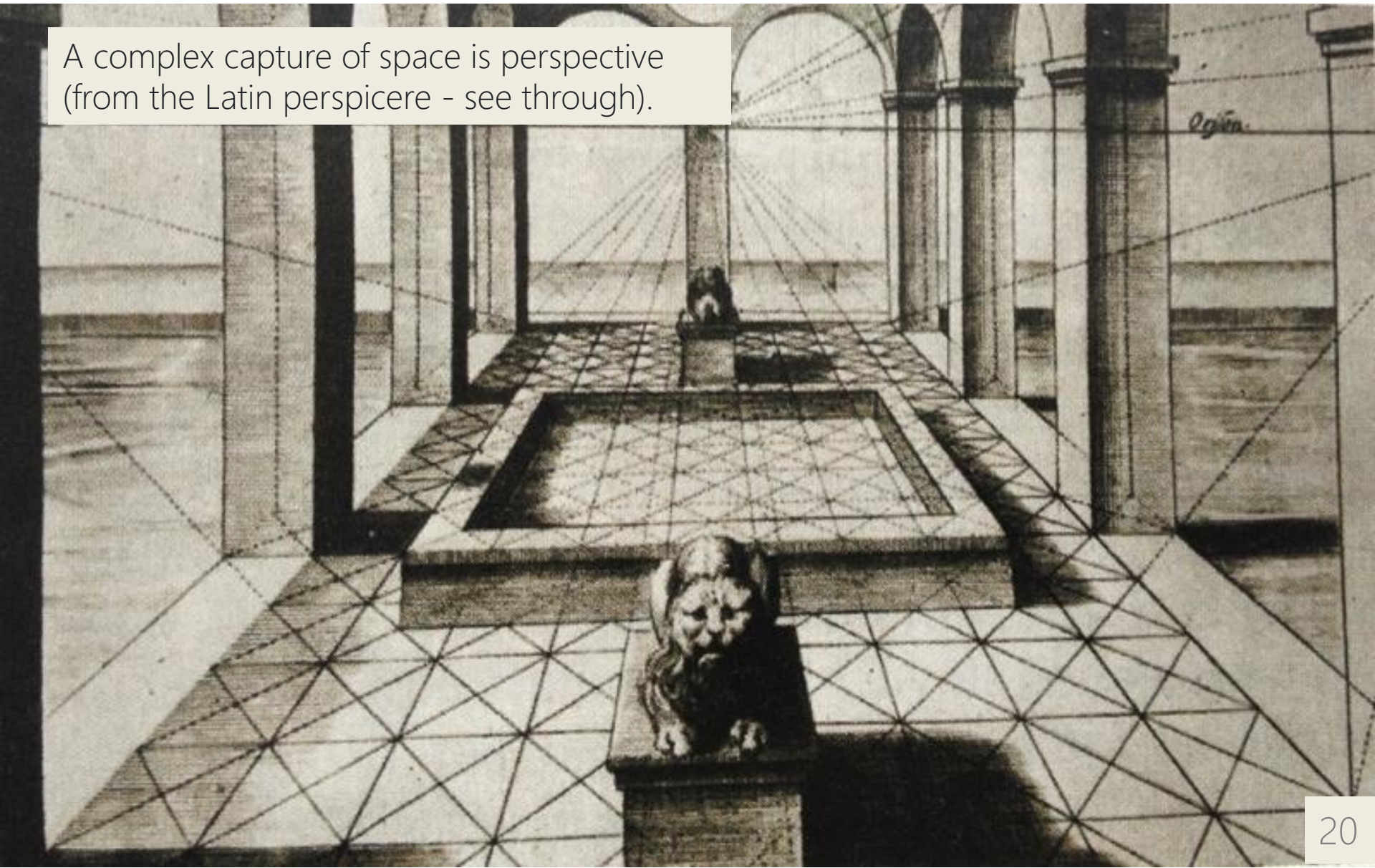
20 - 27

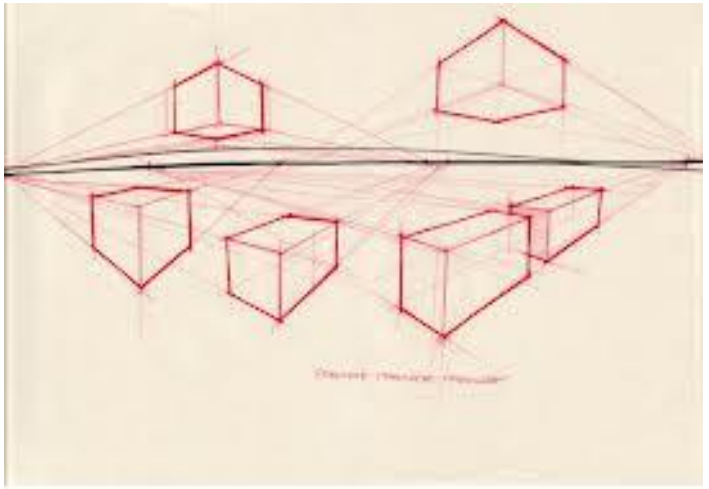
Construction of Space in Image



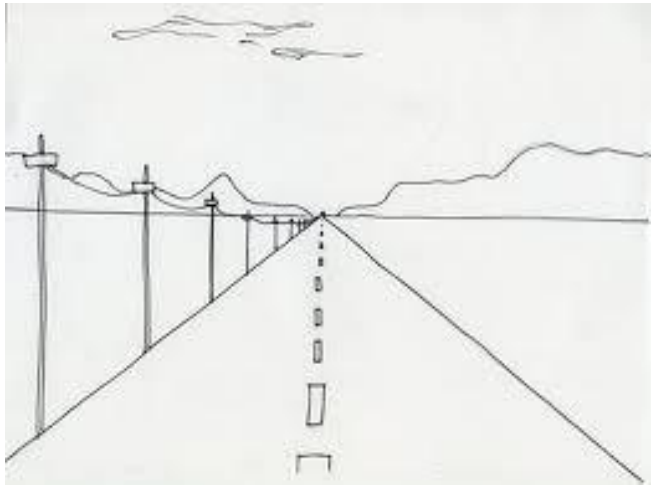
A complex capture of space is perspective (from the Latin perspicere - see through).

Vanishing Point and horizon

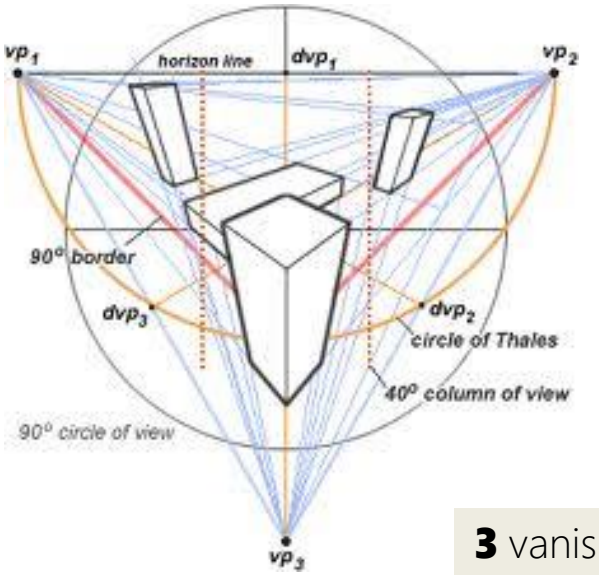
Perspective appears in Italy between 1405 and 1425. The invention of perspective is attributed to **Fillip Brunelleschi** (1420). The principles of construction were than described by **Battista Alberti.**



2 vanishing points

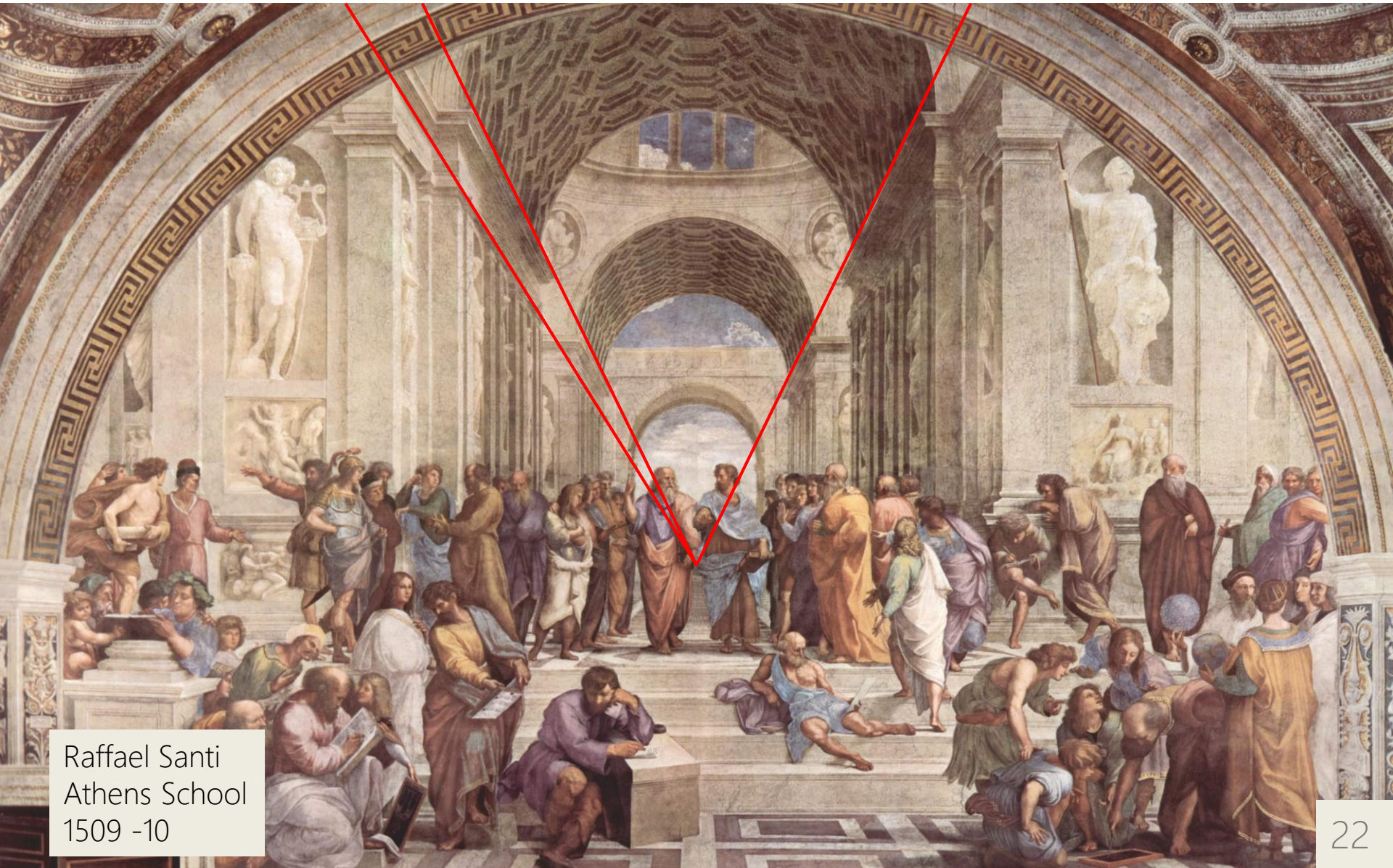


1 vanishing point



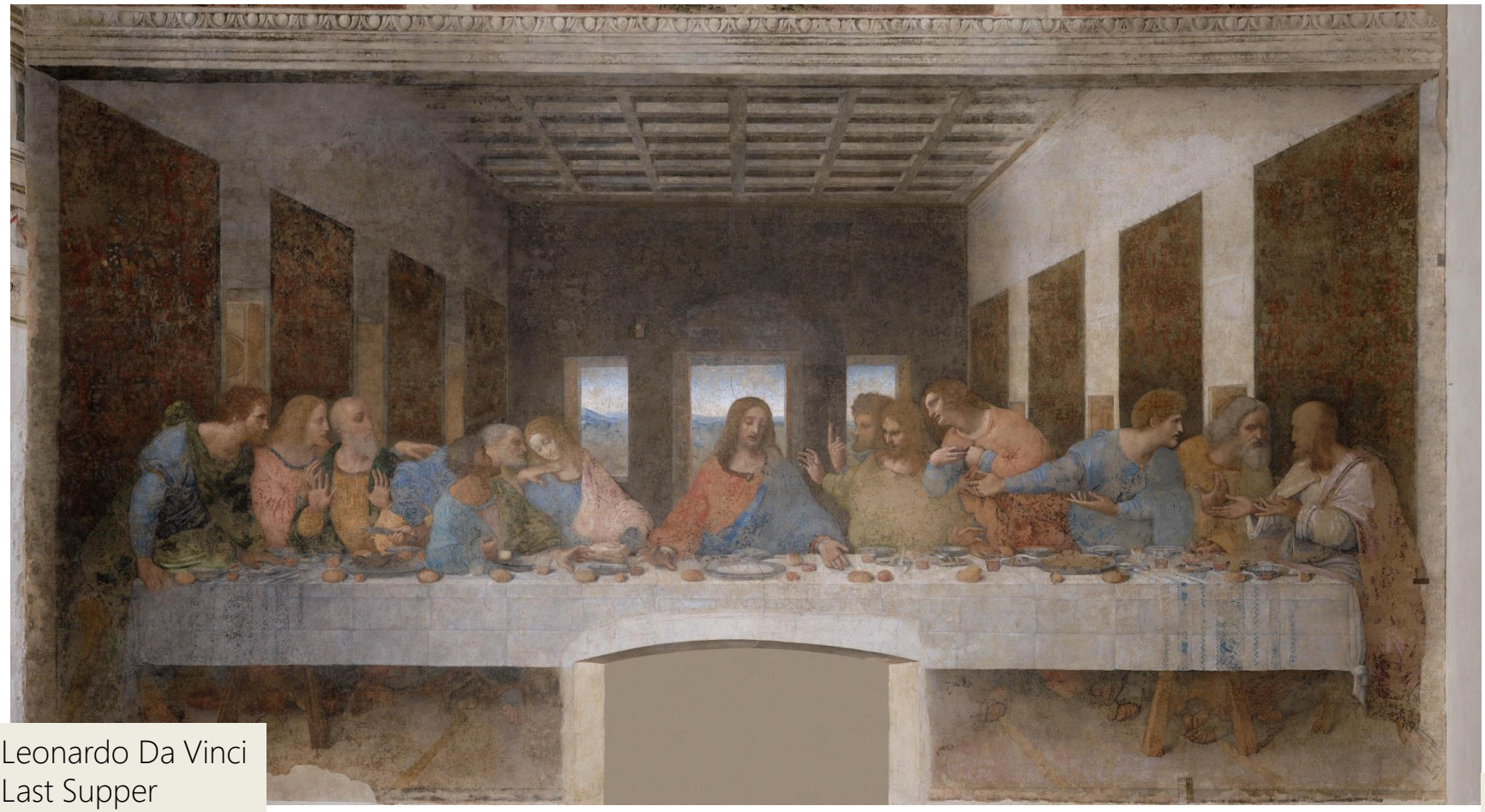
3 vanishing points

1 vanishing point



Raffael Santi
Athens School
1509 -10

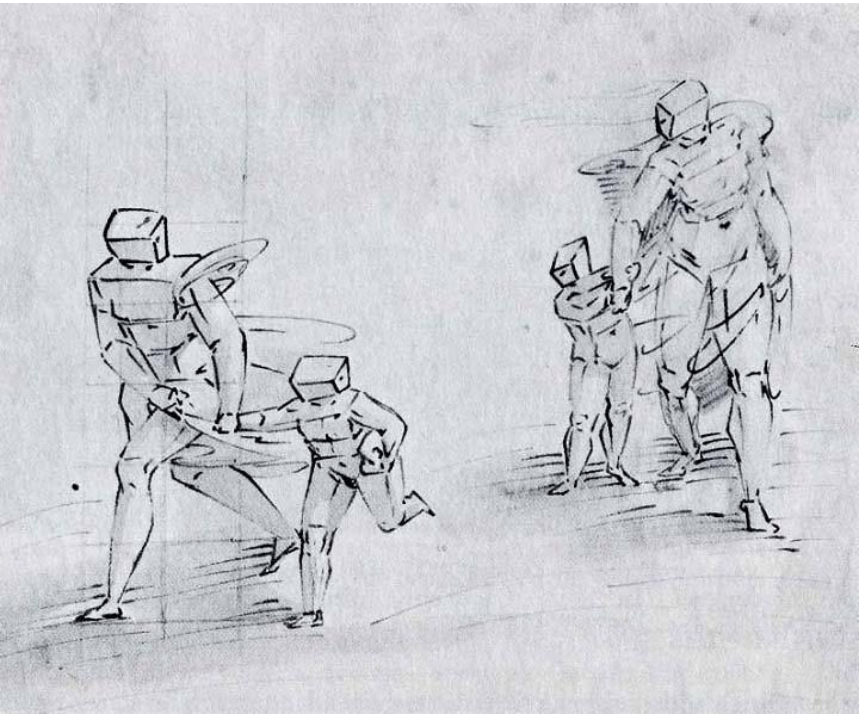
Construction of Image with Perspective View



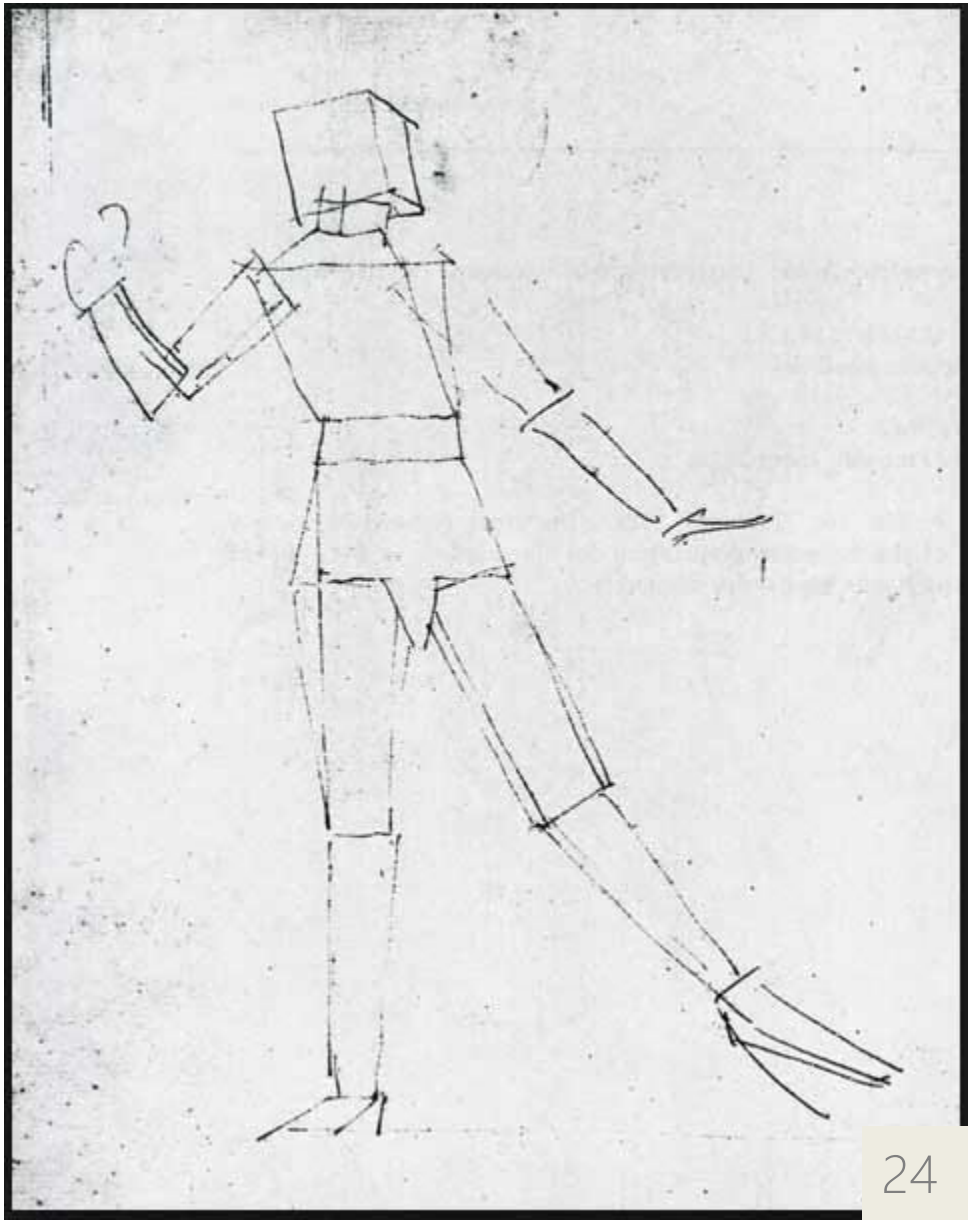
Leonardo Da Vinci
Last Supper
1495 - 98

Construction of Figure

The figure is decomposed into basic geometric shapes to make it possible well inserted into the structure of the space.



Lucas Cambiato

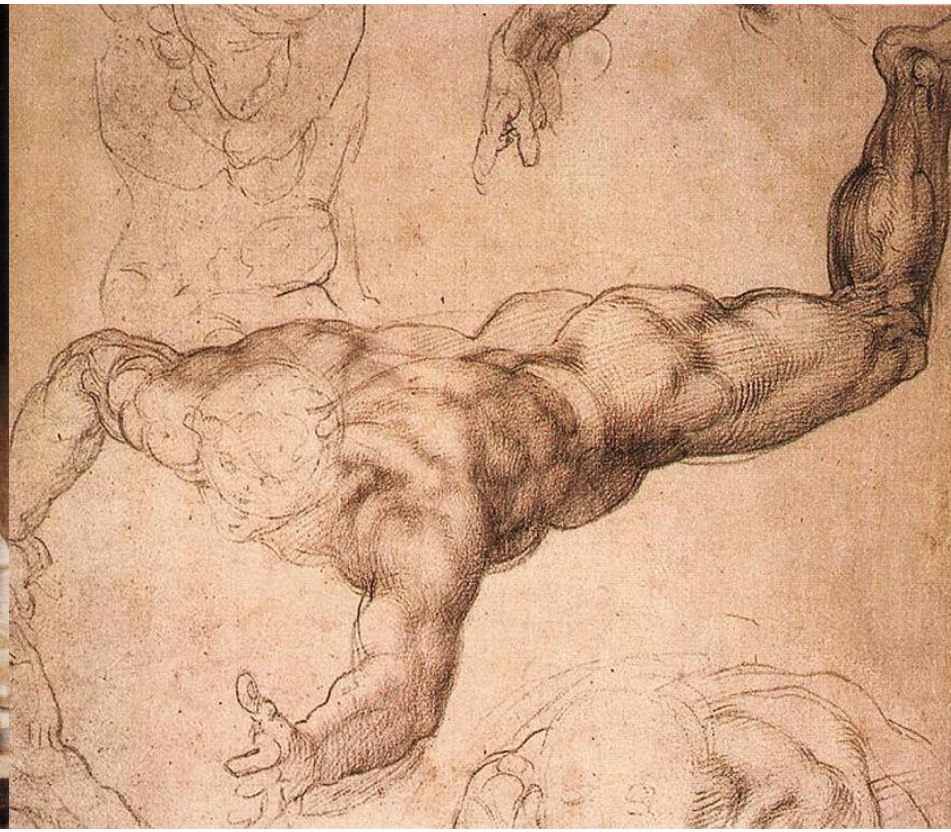


Albrecht Dürer

Shortening of Human Body in Perspective View

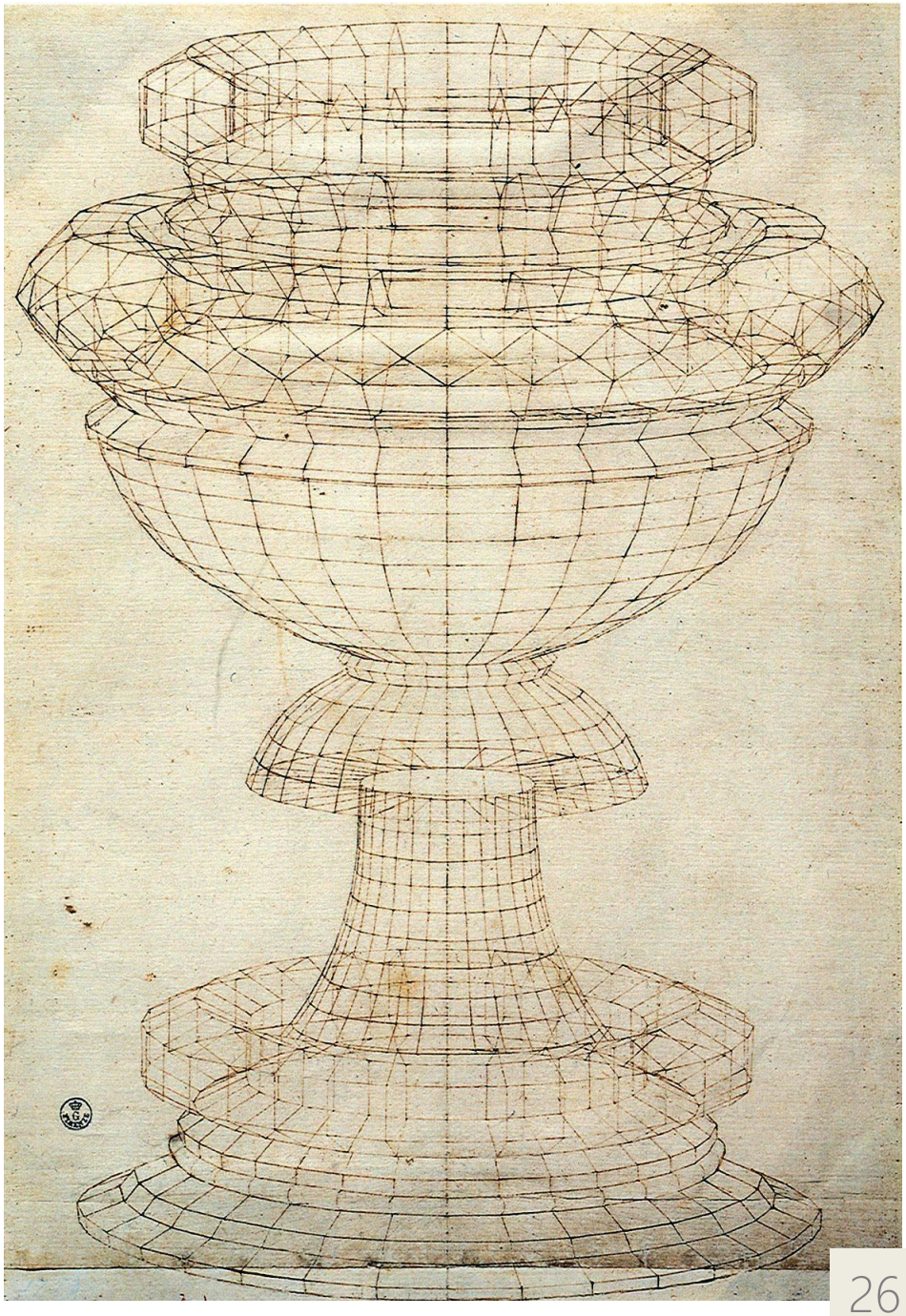
Extreme angle of view. The perspective shortening was mastered in the image up during the Renaissance.

Mantegna
Dead Christ
1480



Michelangelo
Drawing

Construction of an Object in Perspective View



Paolo Ucello
Study of the Chalice
1450

While in previous types of perspective space was symbolized, in the Renaissance perspective it is translated into the language of logic. The space described in this way is infinite.

4. METHODS

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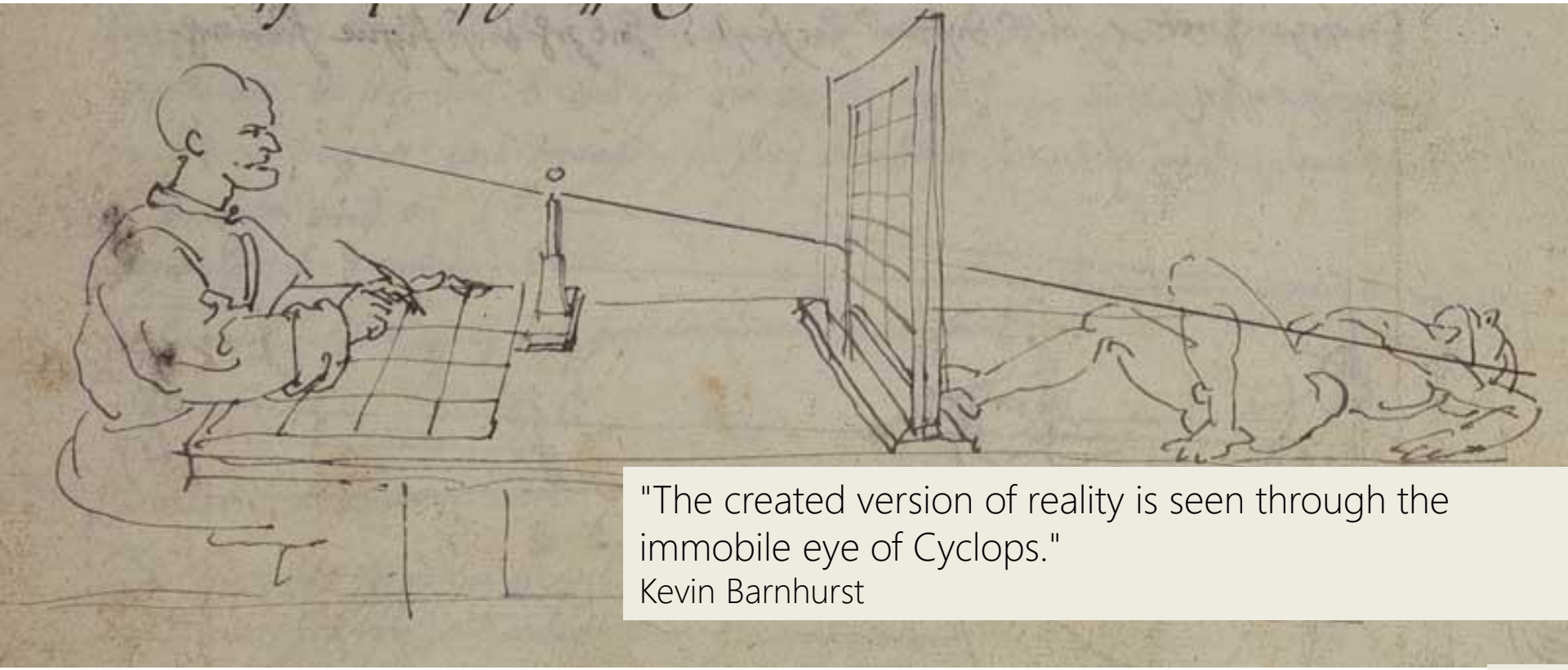
29 - 45

Drawing by Grid

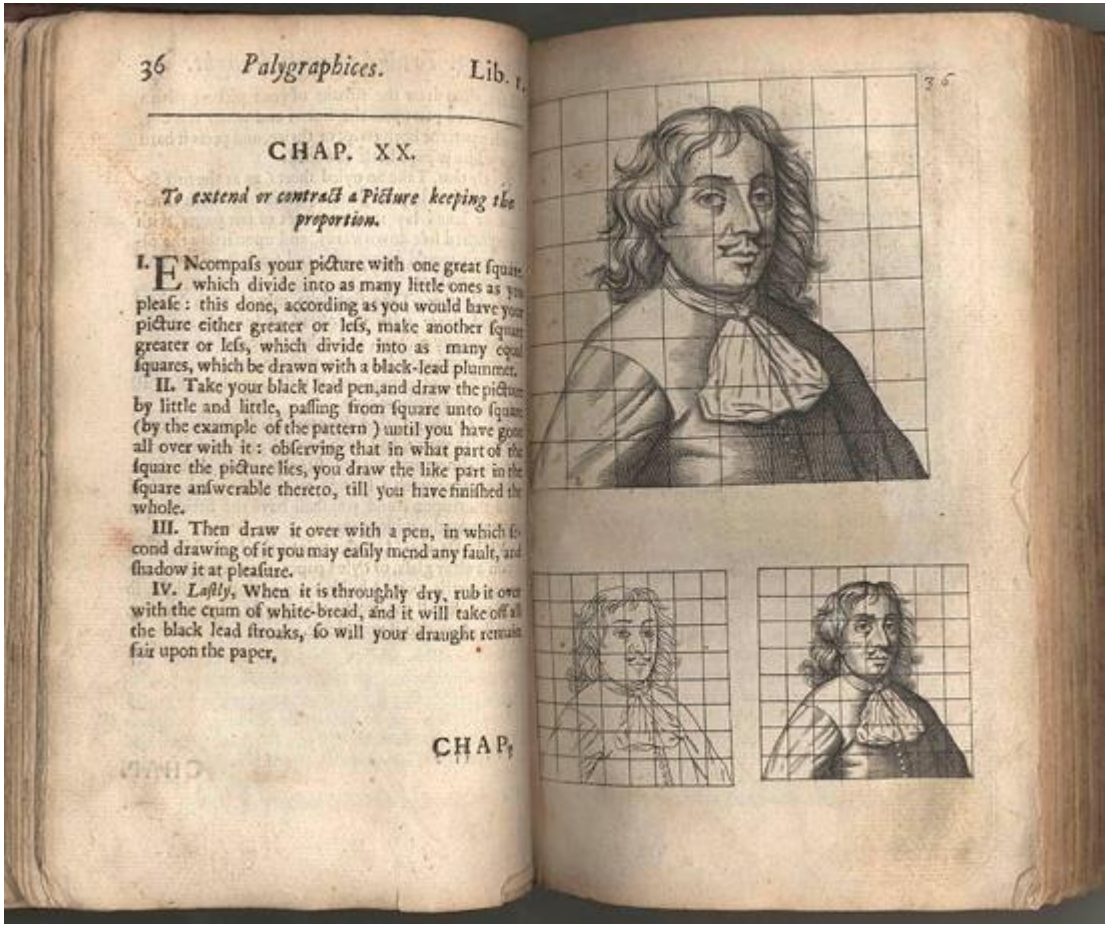
The displayed section of reality is seen through a grid. The segments seen in this way are better converted into a drawn grid.



"The created version of reality is seen through the immobile eye of Cyclops."
Kevin Barnhurst

Albrecht Dürer (1471 – 1528)

Drawing by Grid



36 *Palygraphices.* Lib. I.

CHAP. XX.

To extend or contract a Picture keeping the proportion.

I. ENcompaſs your picture with one great ſquare which divide into as many little ones as you pleaſe: this done, according as you would have your picture either greater or leſs, make another ſquare greater or leſs, which divide into as many equal ſquares, which be drawn with a black-lead plummet.

II. Take your black lead pen, and draw the picture by little and little, paſſing from ſquare unto ſquare (by the example of the pattern) until you have gone all over with it: obſerving that in what part of the ſquare the picture lies, you draw the like part in the ſquare anſwerable thereto, till you have finiſhed the whole.

III. Then draw it over with a pen, in which ſecond drawing of it you may eaſily mend any fault, and ſhadow it at pleaſure.

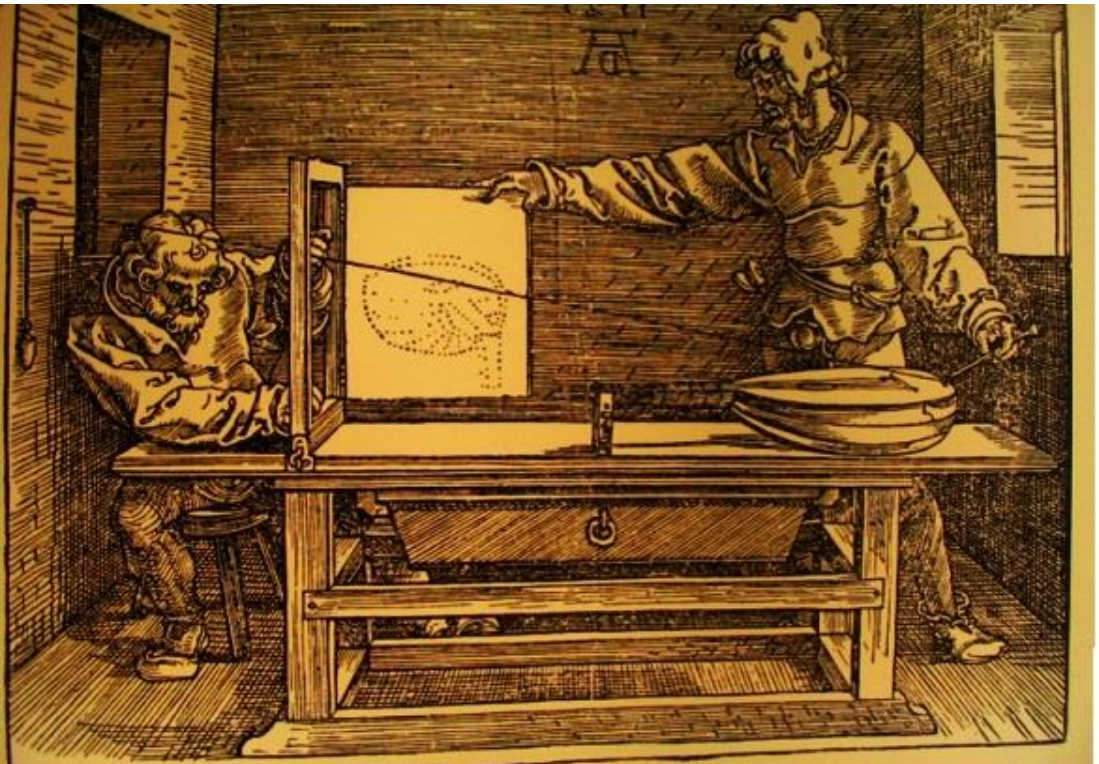
IV. *Laſtly*, When it is throughly dry, rub it over with the crum of white-bread, and it will take off all the black lead ſtroaks, ſo will your draught remain fair upon the paper.

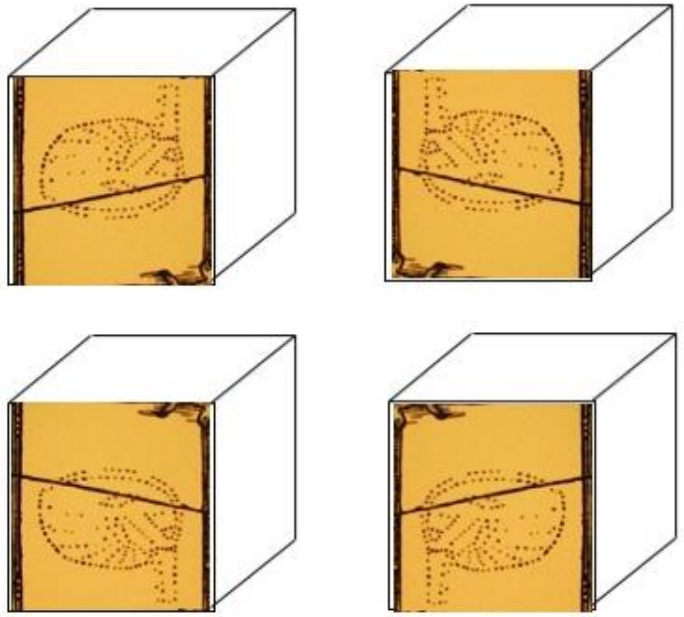
CHAP.

Chapter XX how to preserve the proportions of Salmon's 1675 Polygraphice or the Art of Drawing, Sizing, Painting, Painting, Gilding....

Drawing on a Projection Plane

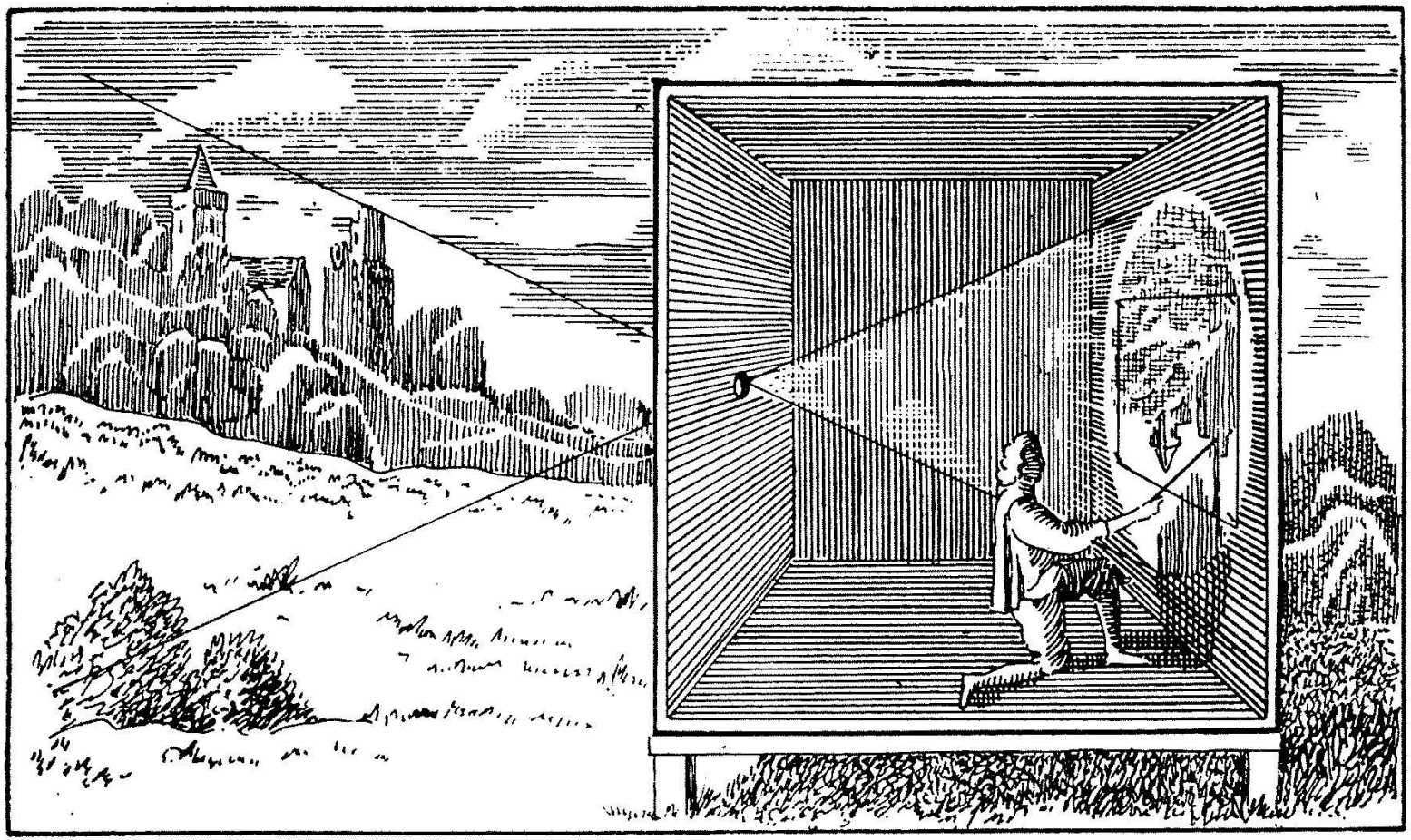
The projection (the area on which the projection is captured) captures points that record the position of the intersection of the projection and the thread, which changes its position from a fixed location in front of the projection by applying the other end to the surface of the displayed object. The points on the projection create points that define the display of the object.





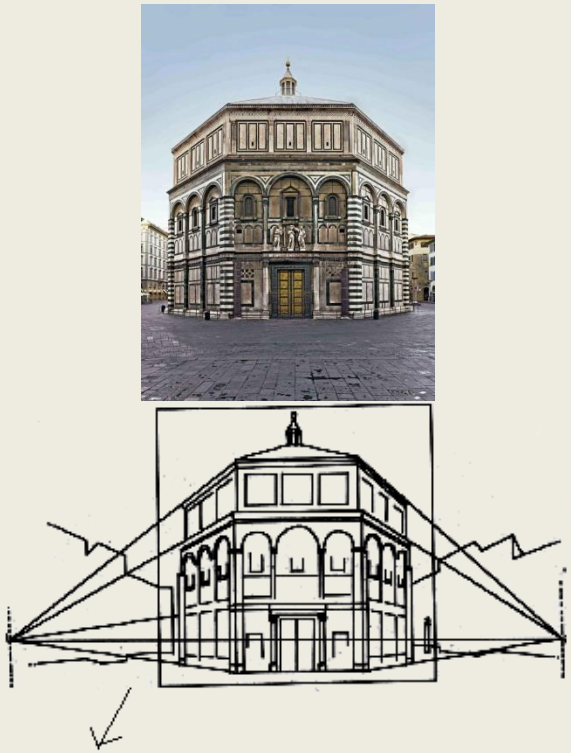
Camera Obscura

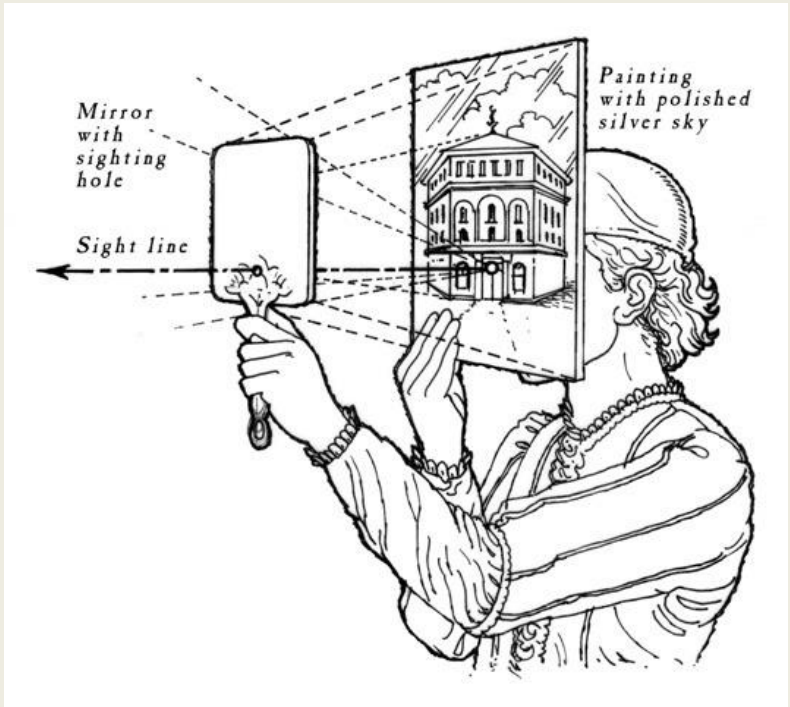
Projection of the external environment projected through a hole on the opposite wall of the enclosure. Inside the room, the artist simply redrawn the projected image upside down.



Fillipo Bruneleschi

The first "augmented reality" - inserting the image into the real environment. Using a mirror that reflects the painted image of the Baptistery, Fillipo Brunelleschi inserts the painting into a real environment for control spatial relations (mid-15th century).





http://smarthistory.khanacademy.org/Brunelleschi.html

Hockney Documetary, 5:10:
https://www.youtube.com/watch?v=evLgneyk4hA

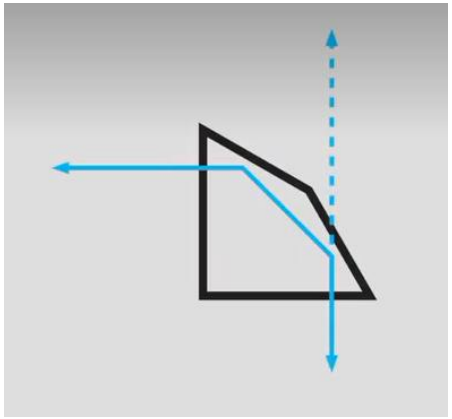
Camera Obscura

Francesca Caponni
Egg Pin Hole
2011

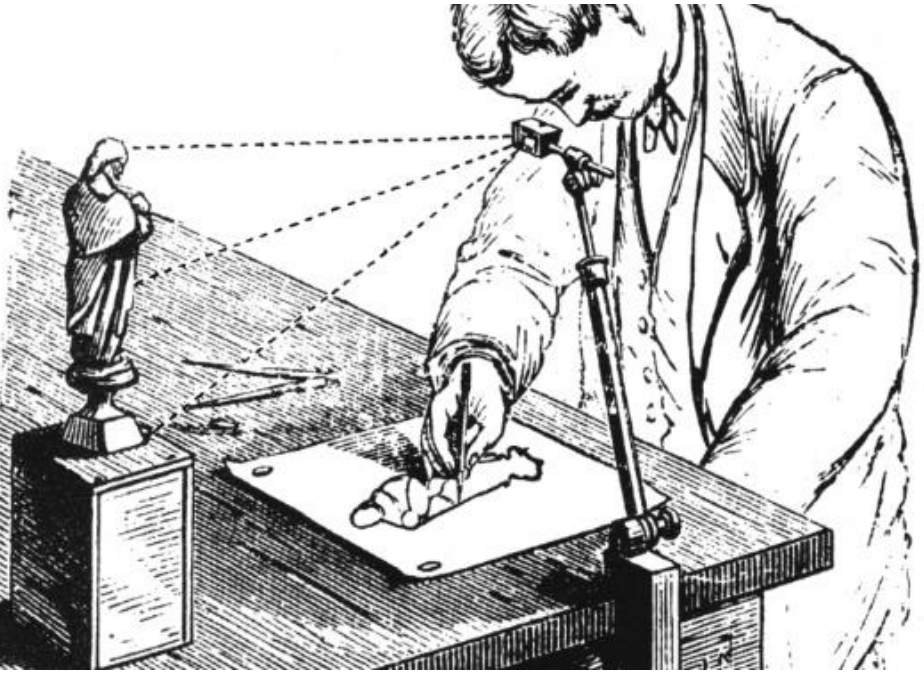
http://www.lomography.com/magazine/71984-the-pinhegg-my-journey-to-build-an-egg-pinhole-camera

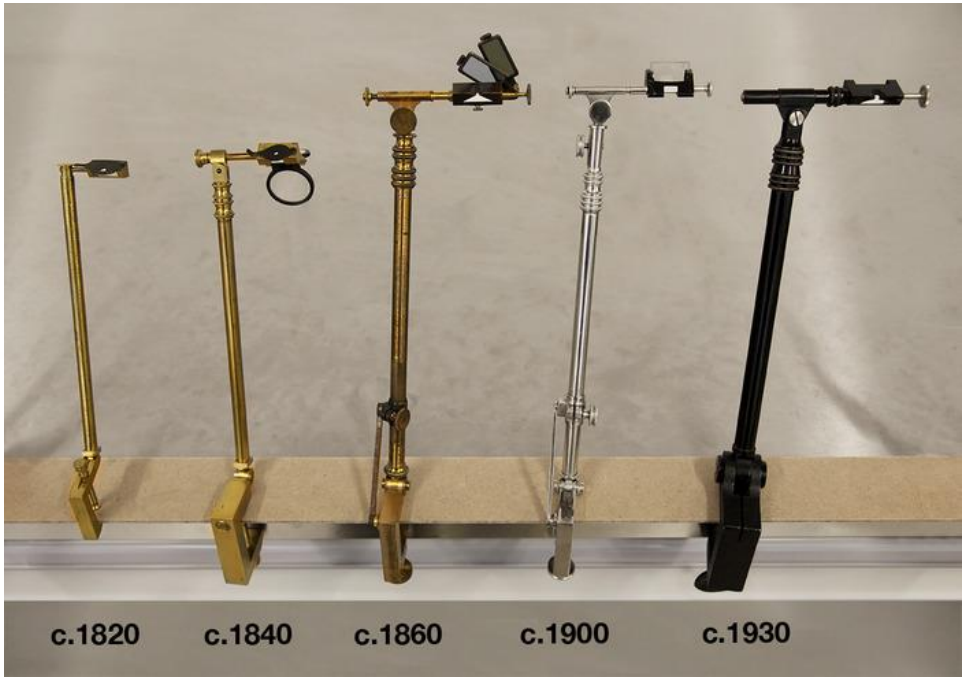
Camera Lucida

W. H. Wollaston, 1807



The basis of this device is a quadrilateral semipermeable prism, in which a horizontal beam of light is refracted in the vertical direction and the object in front of the artist is thus projected onto the paper. The artist looks over the edge of the prism and sees both the drawn scene and the drawn part of the scene. This allows him to draw the shapes of the optical projection.

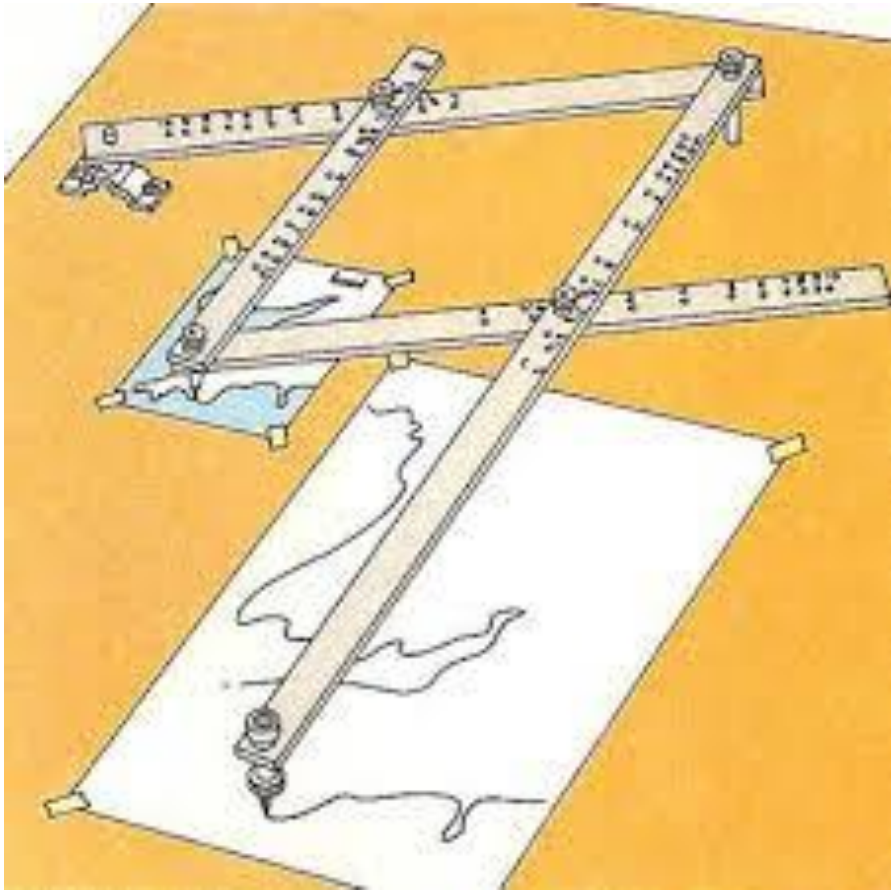




Camera Lucida:
https://www.youtube.com/watch?v=_8-gSPjrjQY

Pantograph

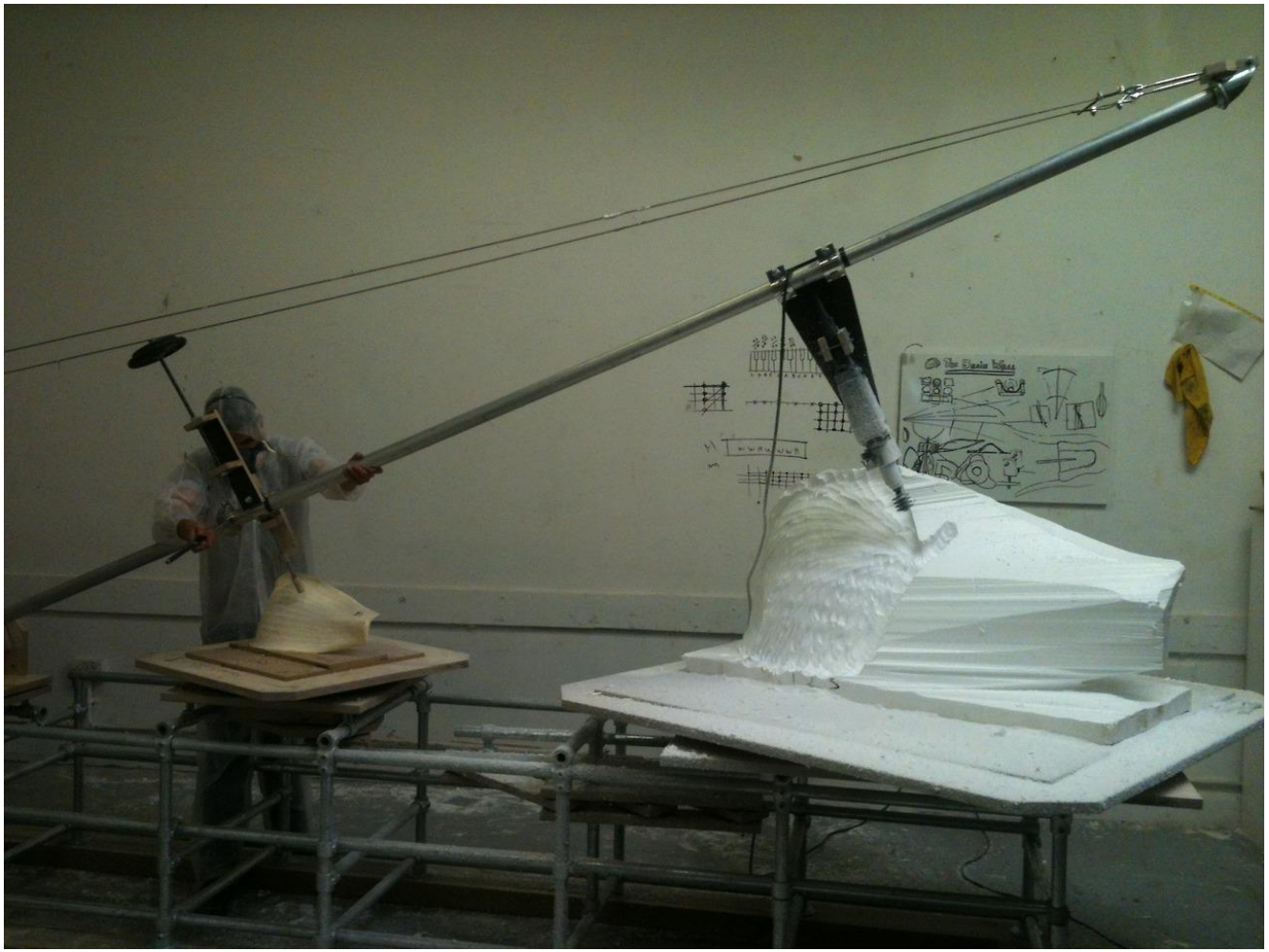
A pantograph is a mechanical device that allows retractable movement and multiple increase of its length in one direction.



Pantograph:
http://upload.wikimedia.org/wikipedia/commons/f/fb/Pantograph_animation.gif

Pantograph

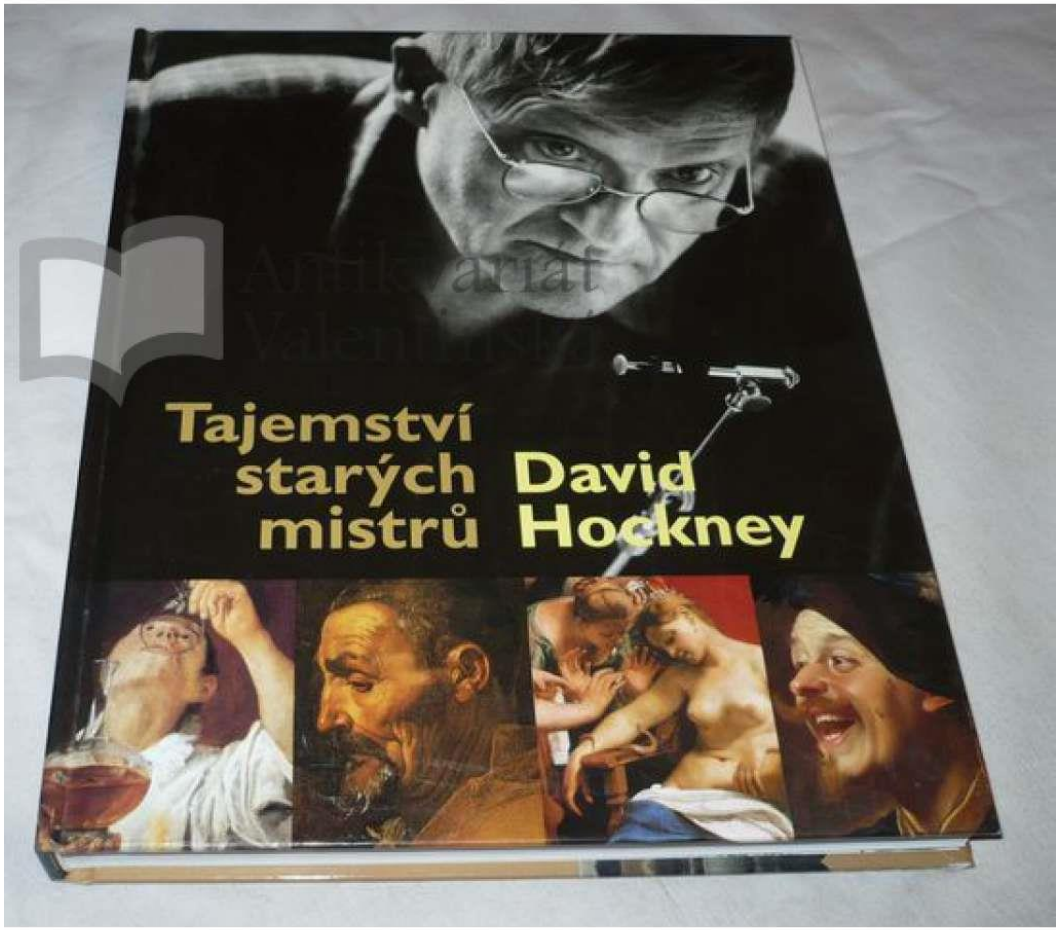
Pantograph when enlarging a three-dimensional object. This method does used until the introduction of CNC milling machines, which replaced the pantograph.



Optics and Depiction

David Hockney: The Secret of Old Masters

"The development of an accurate and detailed depiction of reality went hand in hand with the development of optics. However, a detailed depiction of the objects in the painting appears before the technical possibilities of creating quality lenses ".." In his book (published in 2003), the English painter David Hockney discusses the technical aids of old masters and tests them when creating paintings.

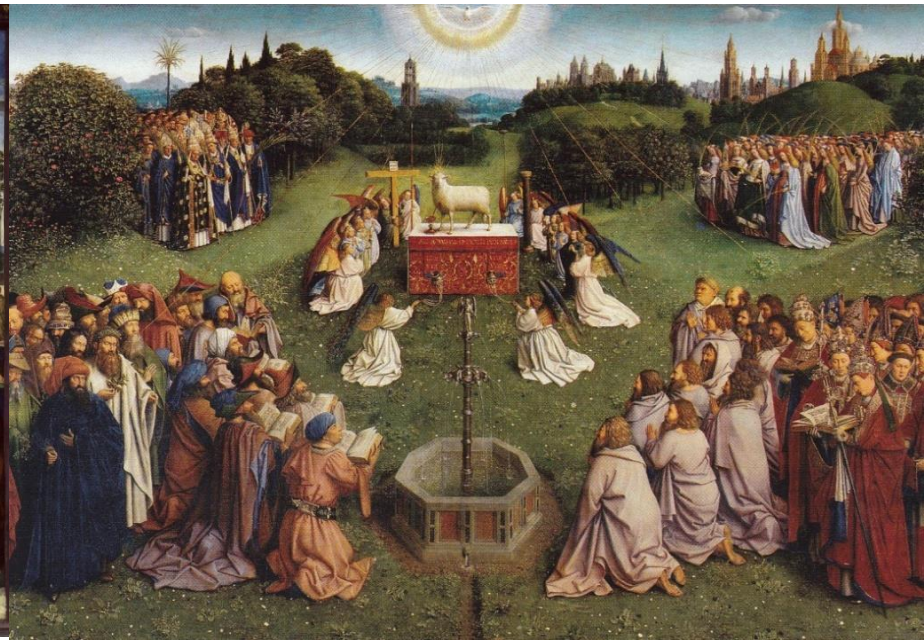


David Hockney: The Secret of Old Masters
Document – painting of patters and reflections: 3.32:
https://www.youtube.com/watch?v=uUJjzDCrQoC

Comparation of Construction of Perspective

Hockney compares the construction of perspective in Italian and Flemish painters: Italians - constructions for vanishing points. Flemish - a compilation of details drawn in perspective.

Perugino
Christ giving Keys of the Temple
1480

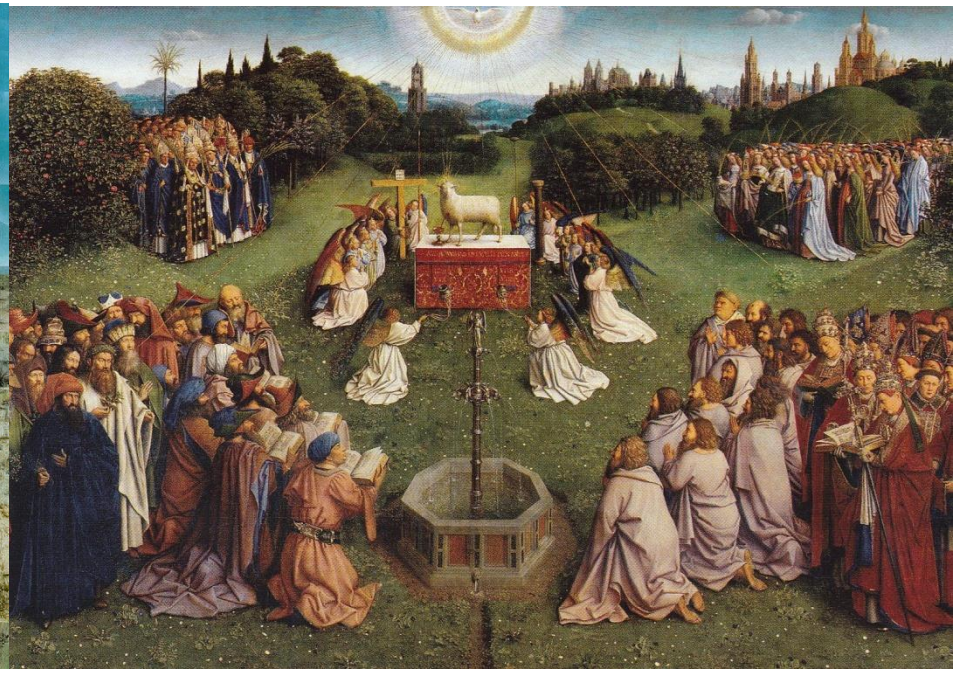


Jan van Eyck
Adoration of the Lamb
1432

Comparation of Construction of Perspective

David Hockney The Secret of Old Masters , document, 8:24:
https://www.youtube.com/watch?v=evLgneyk4hA

David Hockney
Pearlblossom Higway
1986
fotomontáž



Jan van Eyck
Adoration of the Lamb
1432

Optics and Painting

In Jan van Eyck's painting "Wedding Arnolfini "from 1434 a convex mirror appears in the background. David Hockney performed the experiments with concave mirror for transmission reflection on canvas. The concave mirror is known from antiquity as a burning mirror. Archimedes he allegedly used it to destroy Syracuse.

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David Hockney: The Secret of Old Masters , document 1:55:
https://www.youtube.com/watch?v=evLgneyk4hA

Curiosity

Skyscraper nicknamed Walky Talky in London, completed in 2013, has a concave shape. During the summer, the position of the sun concentrates the rays on the street for two hours. At this time the temperature on the street reaches 96 degrees Celsius.

"I knew this was going to happen," said Viñoly, speaking to the Guardian on Friday.
"But there was a lack of tools or software that could be used to analyse the problem accurately.„

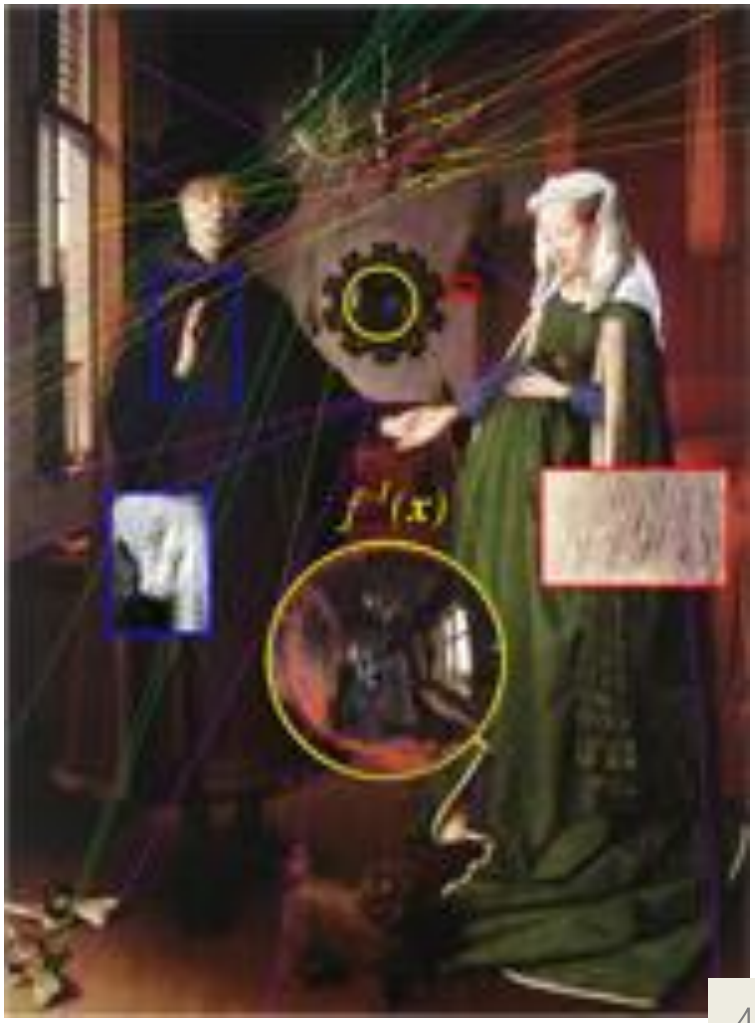
architekt Rafael Viñoly

http://www.theguardian.com/uk-news/video/2013/sep/03/london-walkie-talkie-skyscraper-video

Computer Vision and Image Analysis
in the study of art

.....we see that for some problems these computer methods are more sensitive, more "perceptive," than even a trained artist or art historian, at least for a handful of problems. For instance, visual psychologists have shown that most of us—trained art scholars and artists included—are not particularly good at judging perspective or the location of illumination in a photograph, and, by extension, in a painting but these new computer methods can be extremely good at just such tasks.....

David Stork, Stanford University



Art Optics :
http://www.webexhibits.org/hockneyoptics/

David Stork - Computer vision and image analysis in the study of art:
http://diatrope.com/stork/FAQs.html

Computer Vision and Image Analysis
in the study of art

Analysis of light in the image George de la Tour "Christ in carpentry workshop ", r. 1645. Stork refutes Hockney theories.

Lecture at Stanford University:
Computer Vision in Study of Art, 2012
27.40:
http://www.youtube.com/watch?v=rbL_Y-hZh20

5. OTHER DEPICTION OF SPACE

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47 - 52

Emmanuel Kant

Perception of space is governed by the laws of Euclidean geometry - perspective. Spatial perception is a form of intuition - the mind creates a construct that projects to represent the seen world.

Immanuel Kant
(1724 - 1804)

The statement that space has three dimensions, cannot be made on the basis of experiences.

Kant on Space:
https://www.khanacademy.org/partner-content/wi-phi/wiphi-history/wiphi-kant/v/kant-on-space-part-1

Issac Newton a David Hume

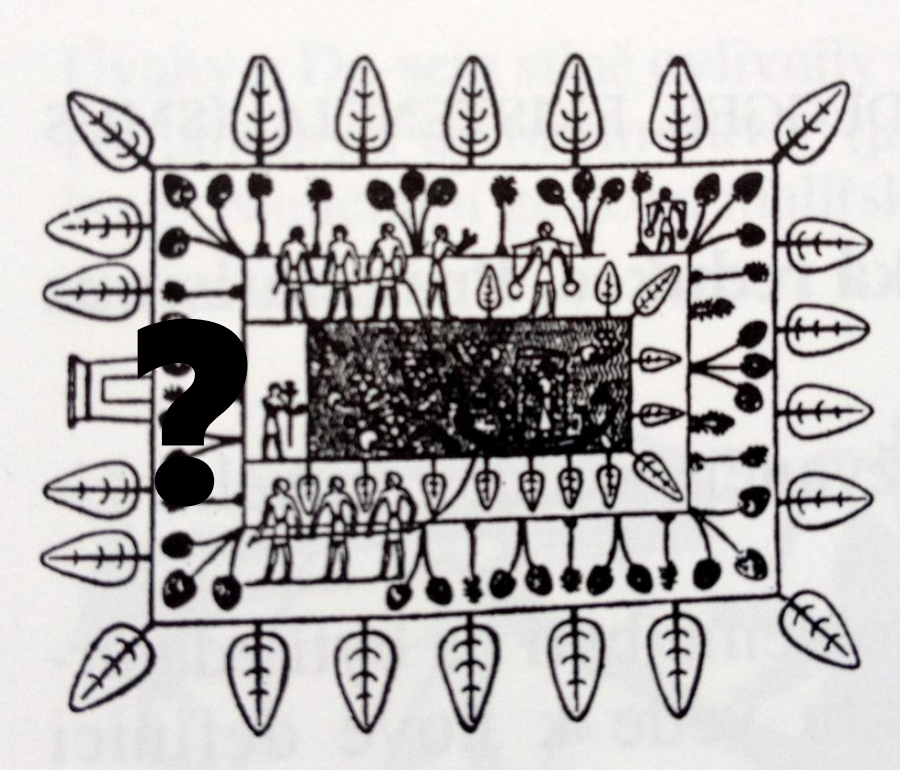
The laws of motion require the existence of some absolute space that has its own ontological reality, independent of human measurement and modes of representation.

No! Space is a simple psychological habit, an empirical concept derived from reality that has no stronger basis than that we are used to living in a certain environment.

Issac Newton
(1643 - 1727)

David Hume
(1711 - 1776)

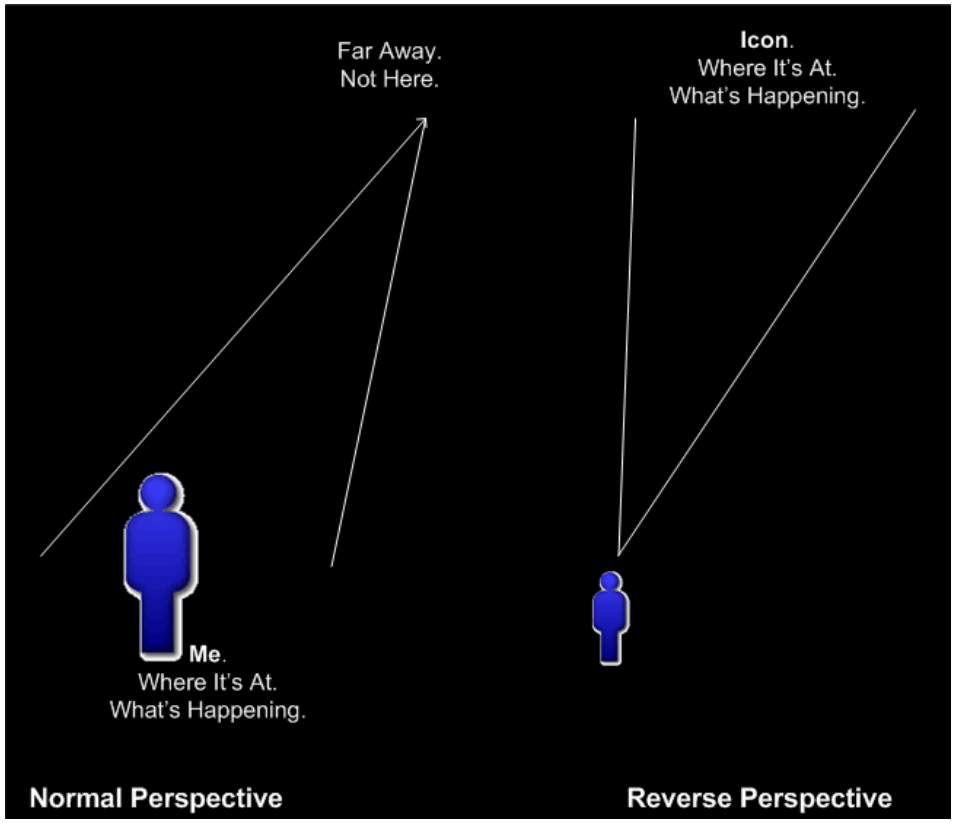
Image as an Information



The first image is informative - it combines a floor plan and a front view. According to our court, the second picture is "real". Each image has a different informative value.

Reverse Perspective

Byzantine art does not want to depict seen world. Icon (Byzantine or Orthodox image that is the object of worship) is depicting the spiritual concept of Christian beliefs.



Hierarchical Perspective

The most important is displayed highlighted on a larger scale.

Duccio di Buonisegna
Maesta
1311

Hierarchical Perspective

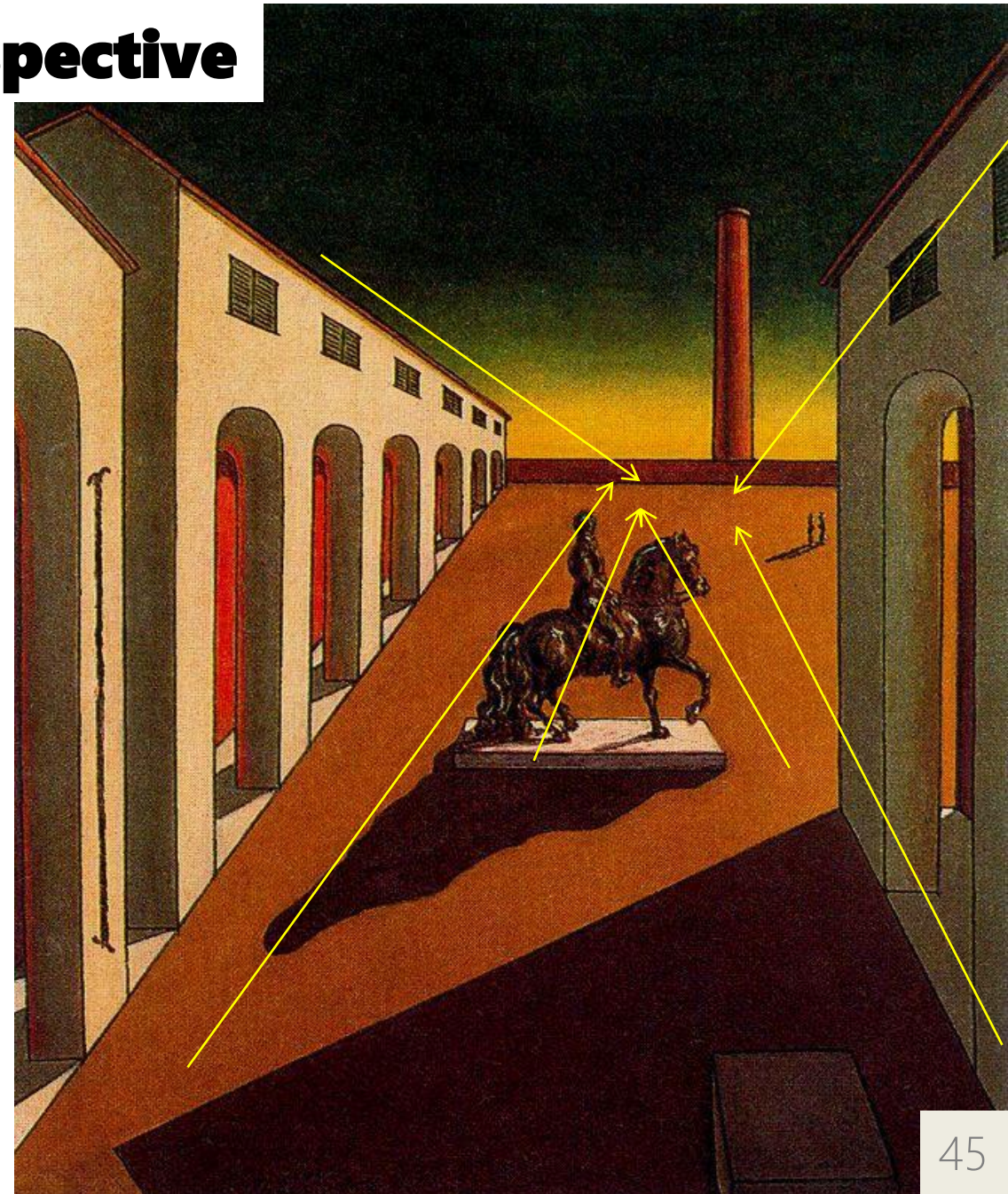
The most important is displayed highlighted on a larger scale.

Perspective and Illusion

Mastering the representation of a perspective abbreviation leads to an illusory perspective. It is an illusion of space. It appears above all in baroque ceiling paintings, where he depicts a view of the sky. The "invention" of the Renaissance perspective is in the Baroque period (17 - 18 centuries) it became a method of depicting illusory spaces, especially in wall and ceiling paintings.

Mix (conceptual) **Perspective**

Although the image appears to be perspective, it is inconsistently created in the image without regardless of the design of the perspective distortion.



Girgio Chirico
(1888 – 1978)
Italian Square with Horse Sculpture

Mix (conceptual) **Perspective**

Marcel Duchamp 1912

Georges Braque 1910

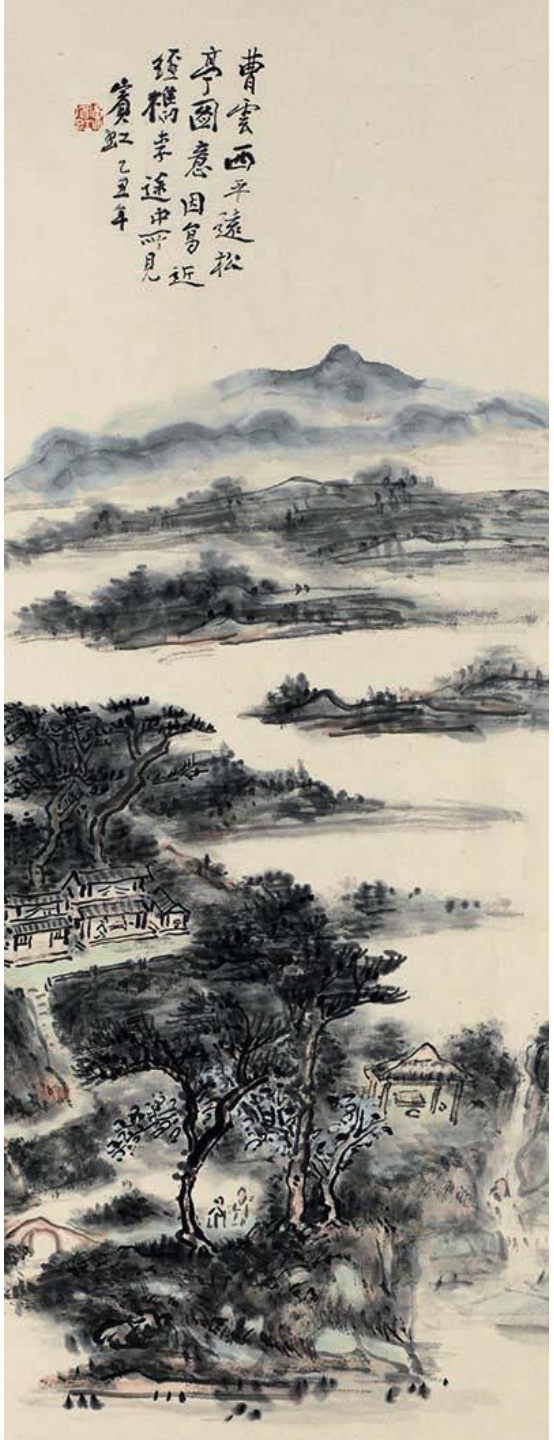
Mix (conceptual) **Perspective**

Refuses to use modern art perspective view, artists looking custom solution..

Bauhaus
1. polovina 20. st.

Vertical Perspective

Perspective in traditional Eastern (China, Japan) art. The individual parts of the scene are arranged one above the other, the farther away, the higher.



Isometric Perspective

The depiction of architecture here does not take into account the perspective distortion established by Western art (the convergence of parallel lines in the vanishing point on the horizon. Instead, the parallel lines run at the same distance side by side to infinity.

Edo Castle

Vertical Perspective

Ksenia Kopalova
A Winter Night in the Tea House

Vertical Perspective

In the first case, only three walls of the interior can be displayed, while in the second in the case of all five walls.

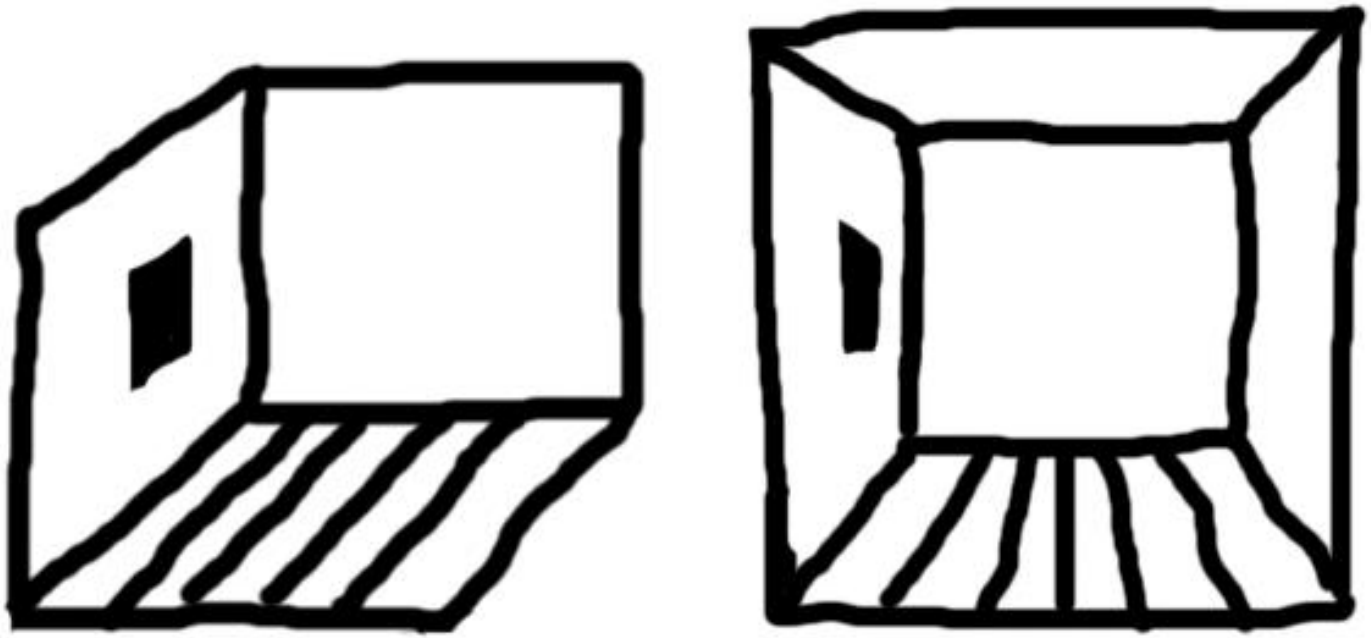
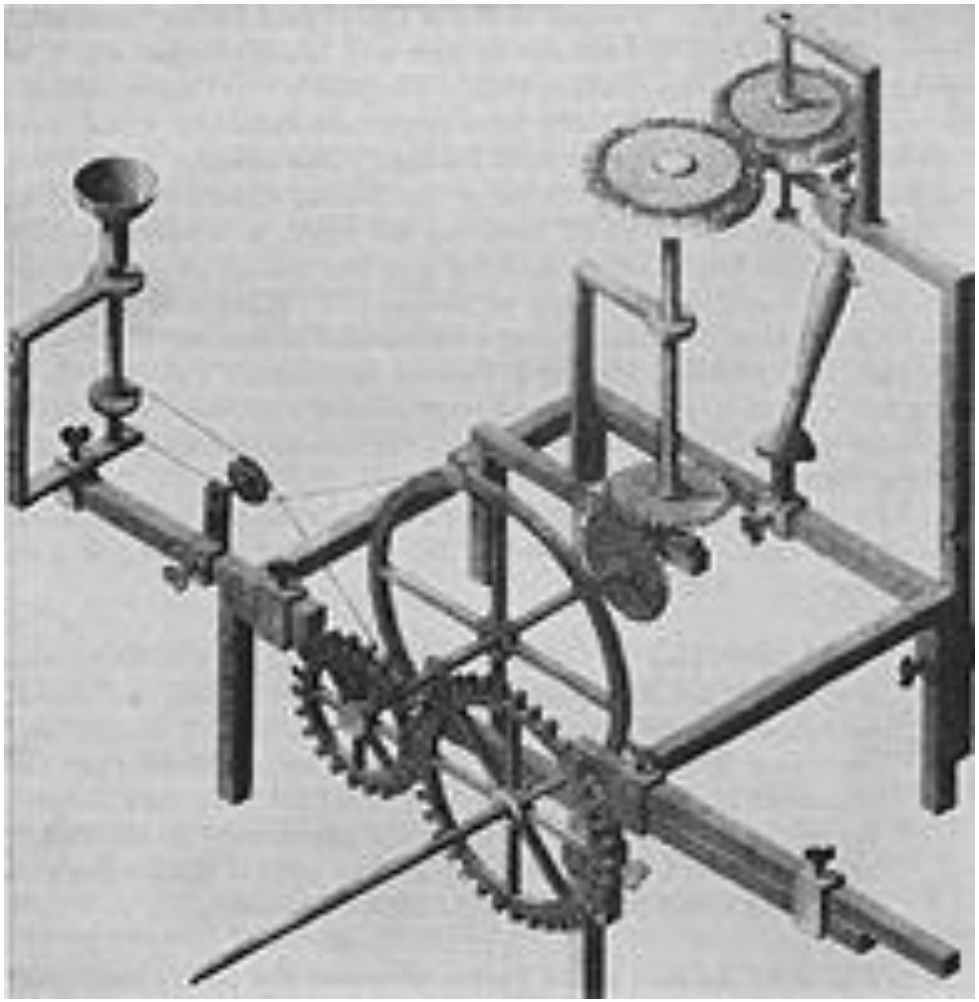


Fig. 1 shows a view of the room according to the eastern principle (isometric view)
Fig. 2 according to the principle of linear perspective

Isometric Perspective

William Farish (1759–1837) first laid down rules for isometric (axonometry, meant by orthographic projection) drawing. The book "On Isometrical Perspective", 1822, wrote for the needs of technical drawings without perspective distortion.



Optical-grinding engine model (1822), drawn in 30° isometric perspective

6. PERSPECTIVE AND A COMPUTER

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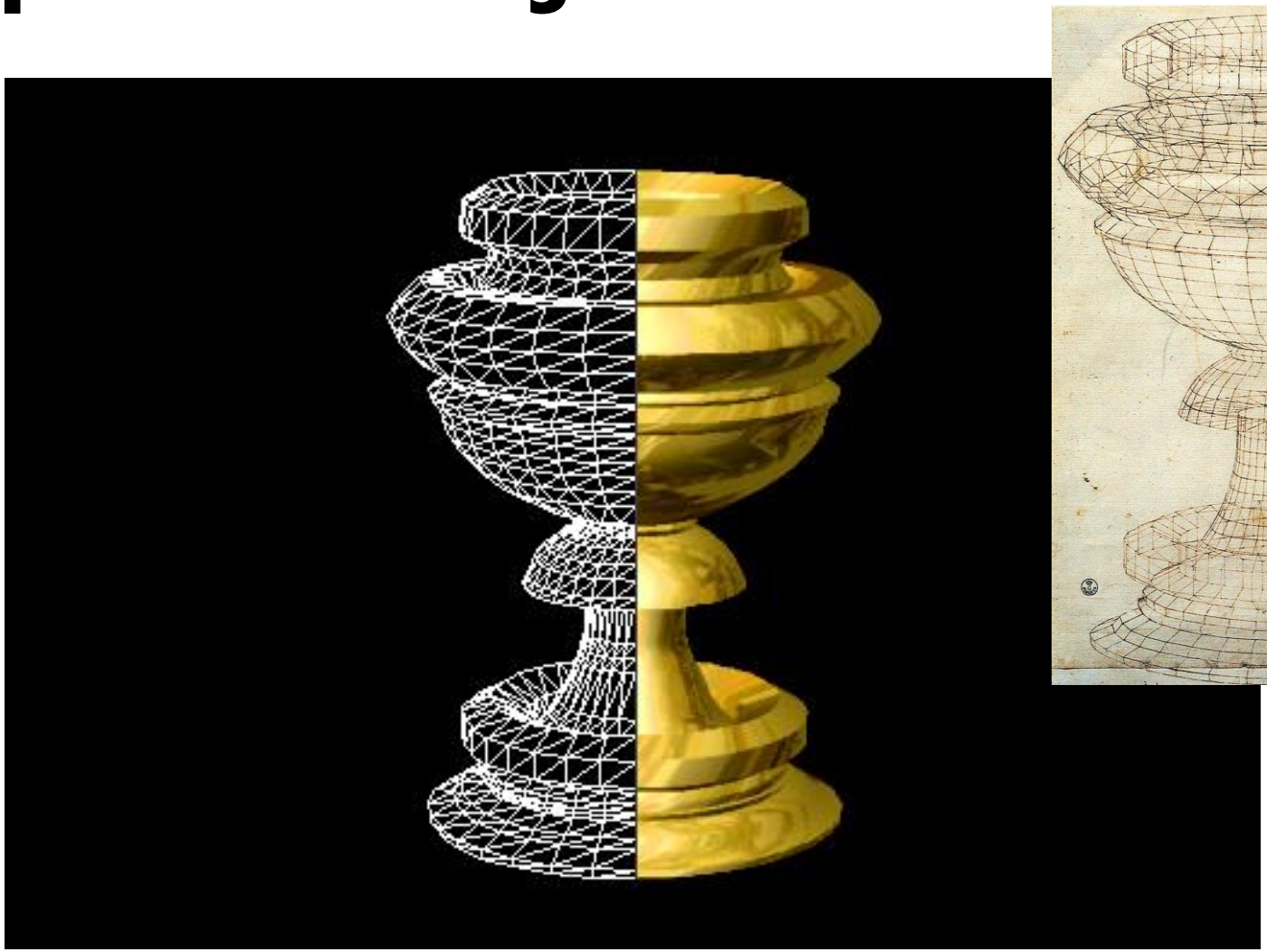
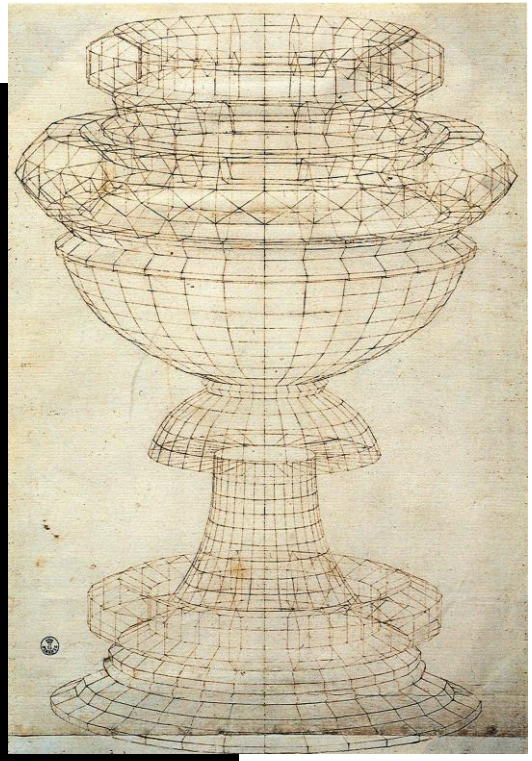
Depiction of 3D Digital Model

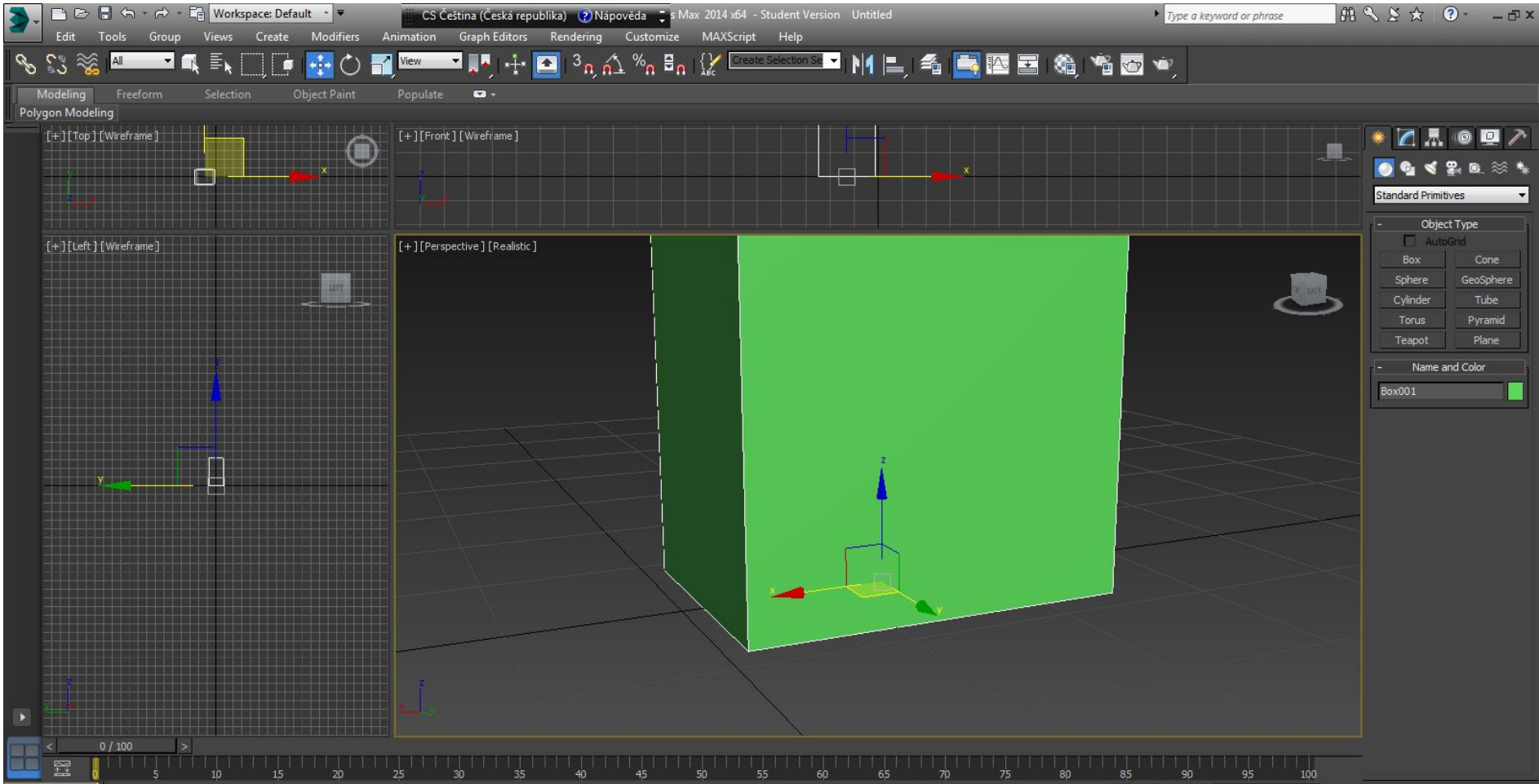




Reconstruction
of the Chalice after Paolo Ucello
CAD model

Depiction of 3D Digital Model

The description of the space using XYZ coordinates is the basis of the virtual description space of all 3D modeling software.



Isometric a Orthographic Project

In isometric / orthographic Projection, parallel edges do not converge on the horizon at one point (vanishing point), but further next to run in parallel, without changing theirs initial distance. 3d modeling programs they often refer to an isometric view as orthographic

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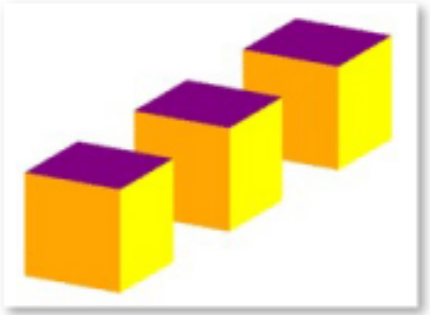
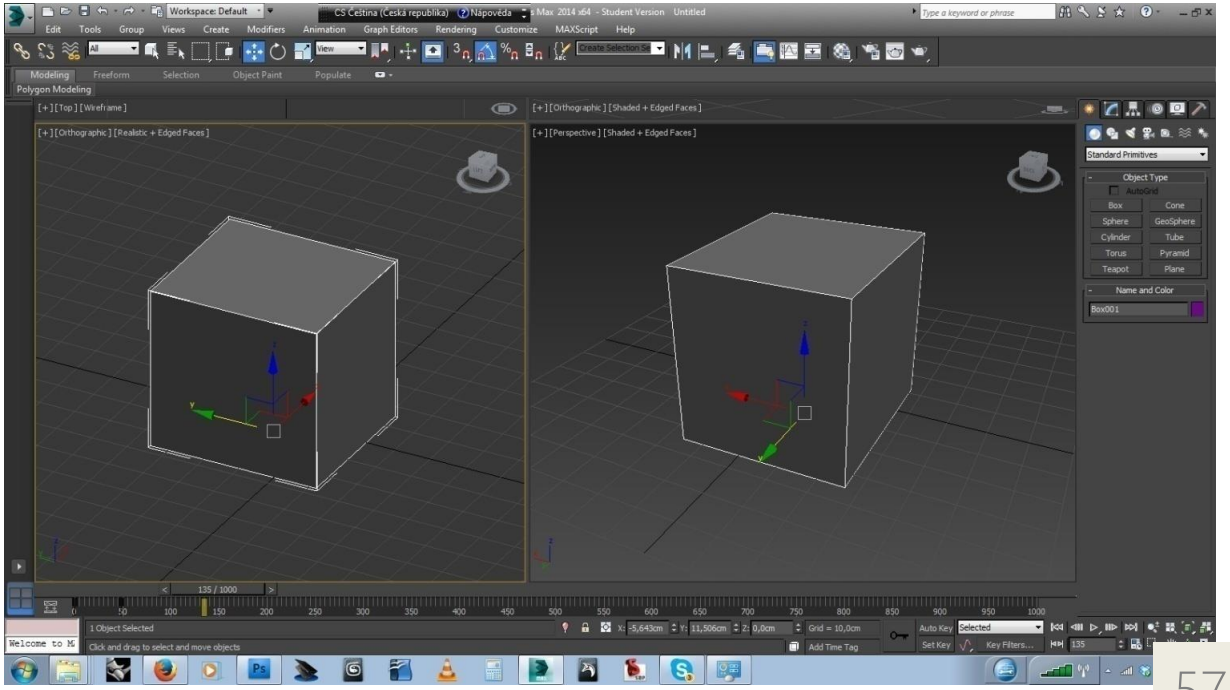
Orthographic Projection

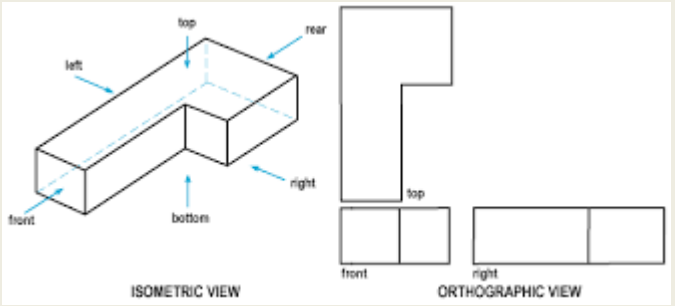


Perspective Projection



Isometric a Orthographic Project

Isometric projection (axonometric projection). Orthographic projection is also called multi-view drawing. An isometric drawing is useful for a better understanding of an object, and an orthographic drawing provides a clearer image and dimensions of an object. An isometric drawing as the same dimensions and an orthographic object provide the actual shape and dimensions of the object



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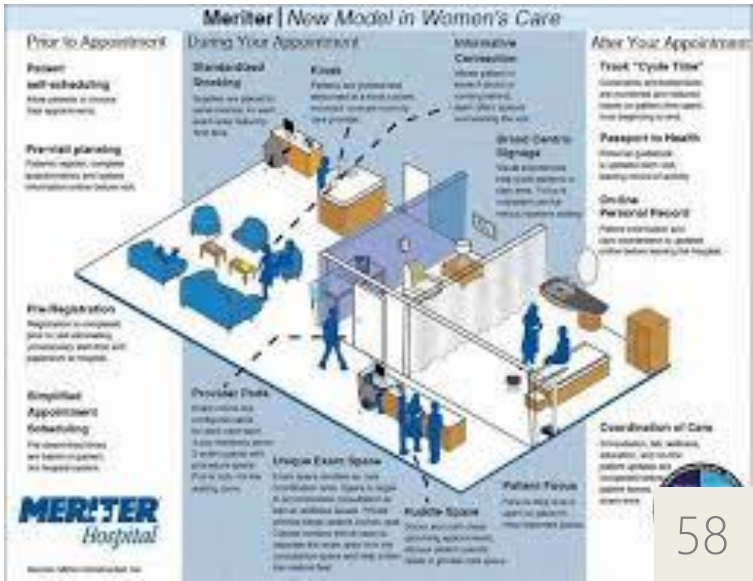
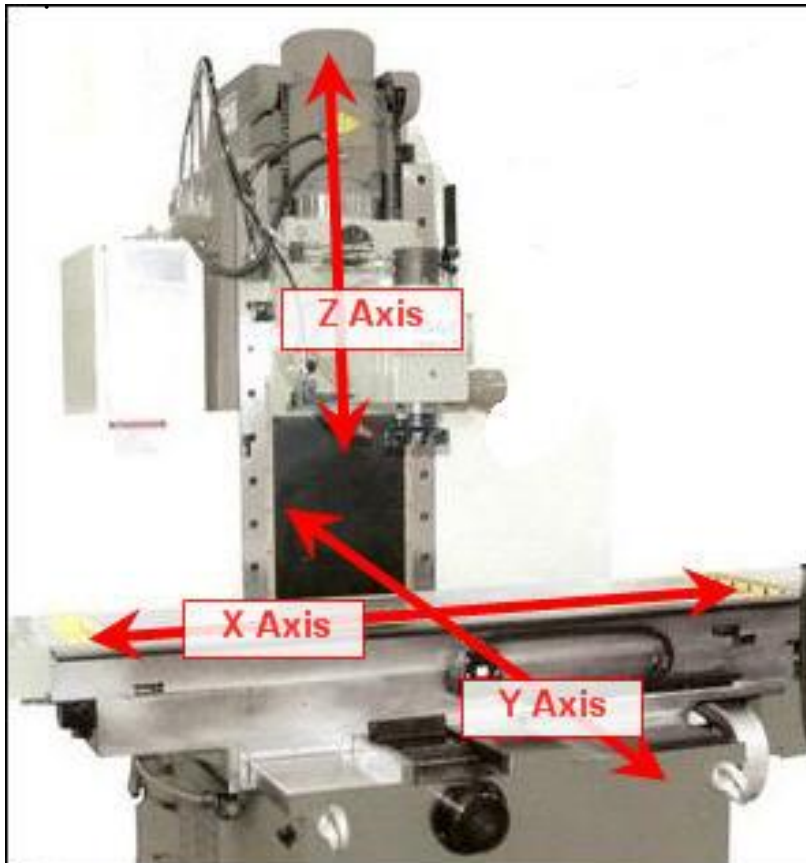
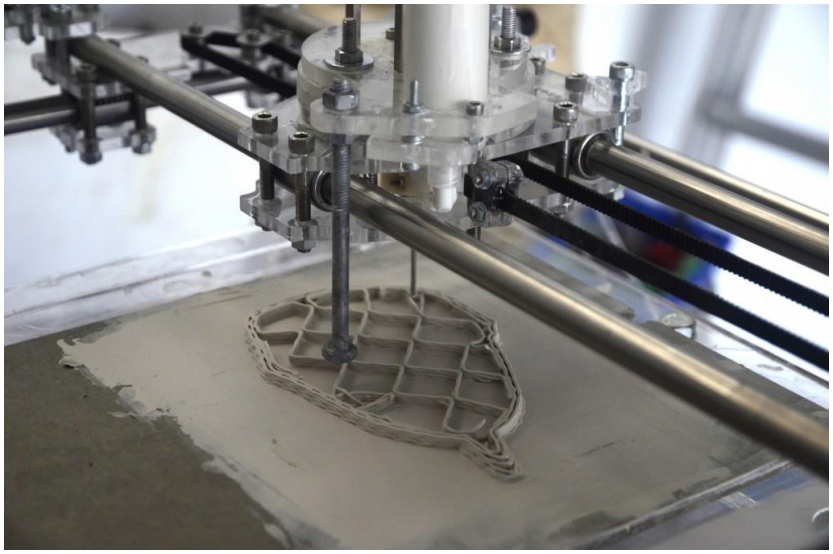


Materialization of a 3D Model

Digital fabrication methods work on the principle of XYZ coordinates, such as CNC machines and 3D printers.





…to be continued