

THE GEOMETRY OF PERSPECTIVE

IN THE ITALIAN RENAISSANCE, ARTISTS LATCHED ONTO MATHEMATICS



BEFORE THE RENAISSANCE, ARTISTS TRIED TO GIVE A SENSE OF DEPTH BY USING DIFFERENT TECHNIQUES



Tomb of Neb-Amun (-1370)

In Egypt, everything was flat, without any perspective effects and the body was broken into parts viewed from different angles.



Fabriano, Adoration of the Magi

A "sensed" perspective: the most distant objects are smaller. The figures in the foreground are larger than the horses which are larger than the castle.



Pompeian Fresco

From antiquity, an intuitive "fish bone" representation gave a sense of depth.

IN THE RENAISSANCE, ARTISTS WERE AT ONCE PAINTERS, SCULPTORS, ENGINEERS, ARCHITECTS AND TRUE MEN OF SCIENCE. Numerous treatises treat perspective as arising from purely geometric rules.

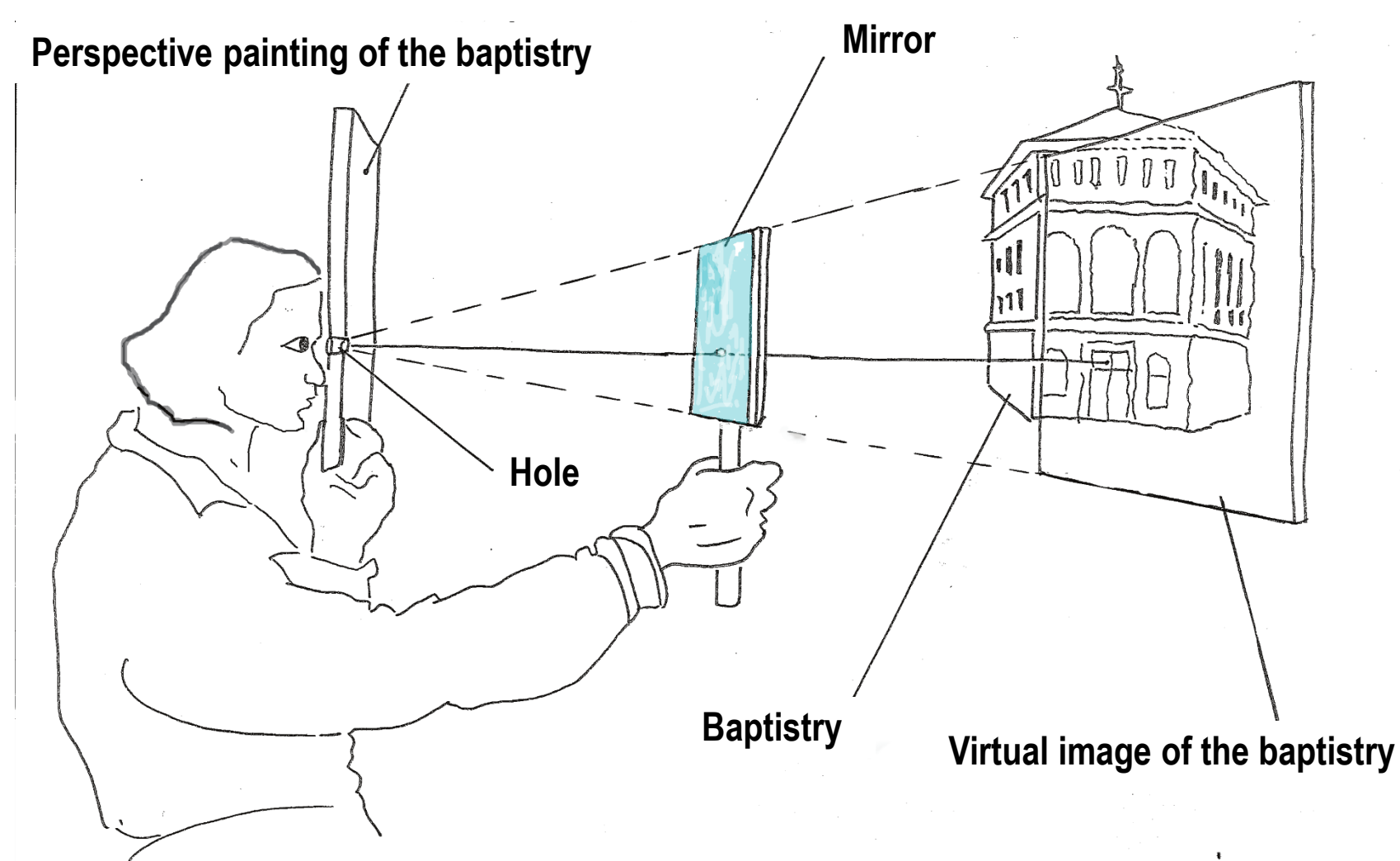
The first great artist to think about the mathematical aspects of perspective was the architect

FILIPPO BRUNELLESCHI

In 1415, Filippo Brunelleschi performed an experiment: the tavoletta. He painted a Florentine Baptistery and developed a device showing the perfect agreement between the building and the painting executed according to his method:

LA COSTRUZIONE LEGITIMA

The picture is painted on one side of the tavoletta which is pierced with an eyelet. He holds the tavoletta facing him on the unpainted side and looks at the building through the eyepiece. He inserts a mirror held at arms length between tavoletta and the building. By correctly placing the device, he finds that the image of the painting reflected in the mirror coincides with the building.



LA TAVOLETTA

A BOOK THAT CREATED A SCHOOL: "DE PICTURA"

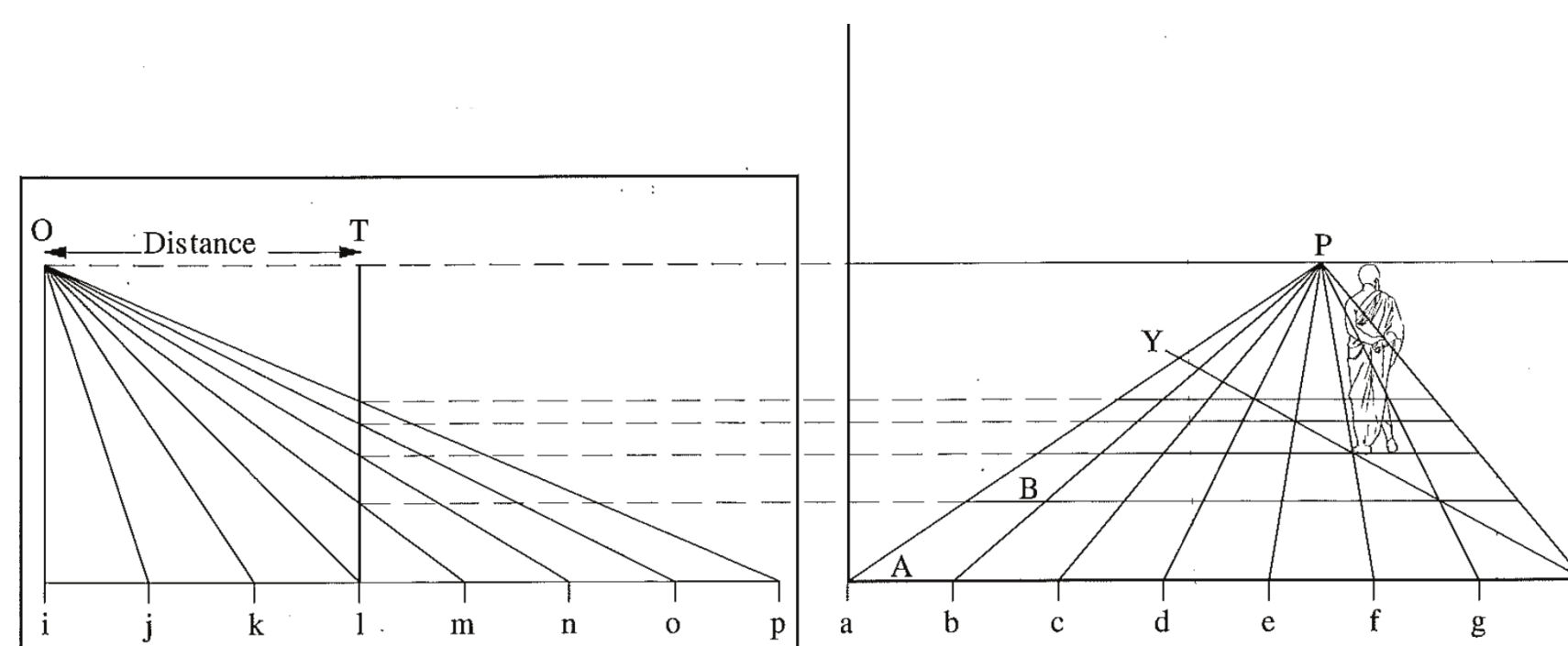
LEON BATTISTA ALBERTI

"I would like a painter to be educated as much as possible in all of the liberal arts, but above all, I want him to possess a good grasp of geometry. I am even of the opinion of the very old and very famous painter Pamphilia who taught the first elements of painting [...]: No one can become a good painter if they don't know geometry."

THE VANISHING POINT PERSPECTIVE OF ALBERTI: LA COSTRUZIONE ABBREVIATA

1. " I first draw a quadrilateral and determine the size I want to give to men in my painting. I divide the height of this man into three parts ... Using this measurement, I divide the baseline of the border into as many parts it can contain (a, b, c ... h) I then place a single point in a place where it is visible inside the rectangle, no higher than the man that I want to paint (P). I then draw straight lines from this point to each of the baseline divisions ... "

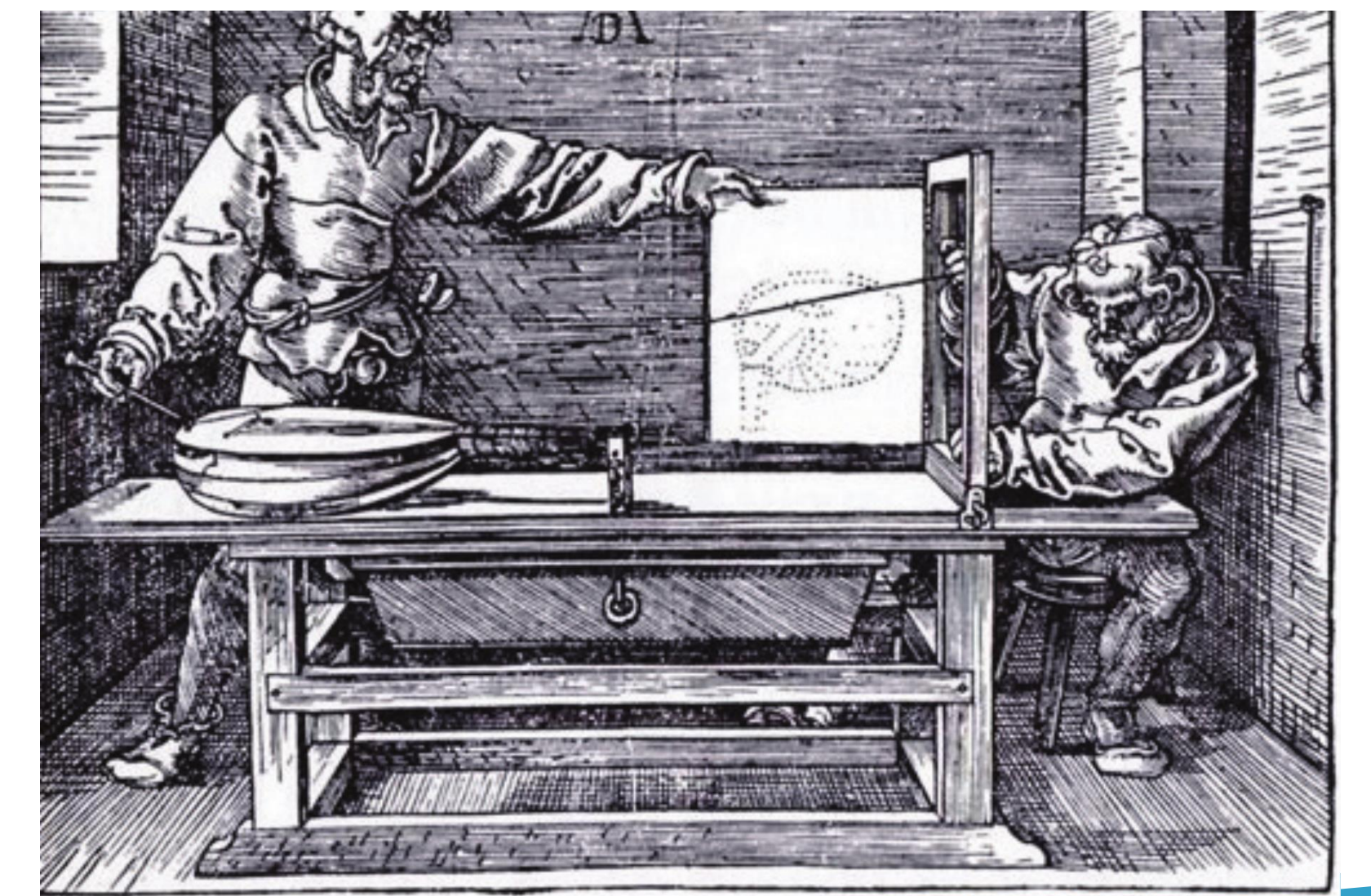
2. Alberti then uses an auxiliary figure on which he divides the straight line (ip) in the same way as the straight line (ah). He then places the point O at the height of P on the vertical through i. He draws the straight lines Oi, Oj ... Op from this point. The distance OT is equal to the distance between the viewer's eye and the painting. The vertical passing through T allows horizontals to be copied onto the painting.



LA COSTRUZIONE ABBREVIATA

THE INTERSECTOR:

Alberti invented a technique to draw contours that prefigured the celebrated window of Dürer. He set up a vertical veil of very fine threads divided into squares by means of thicker threads positioned between the painter's eye and the object to be drawn. The contours of the object are located on the grid pattern of the veil.



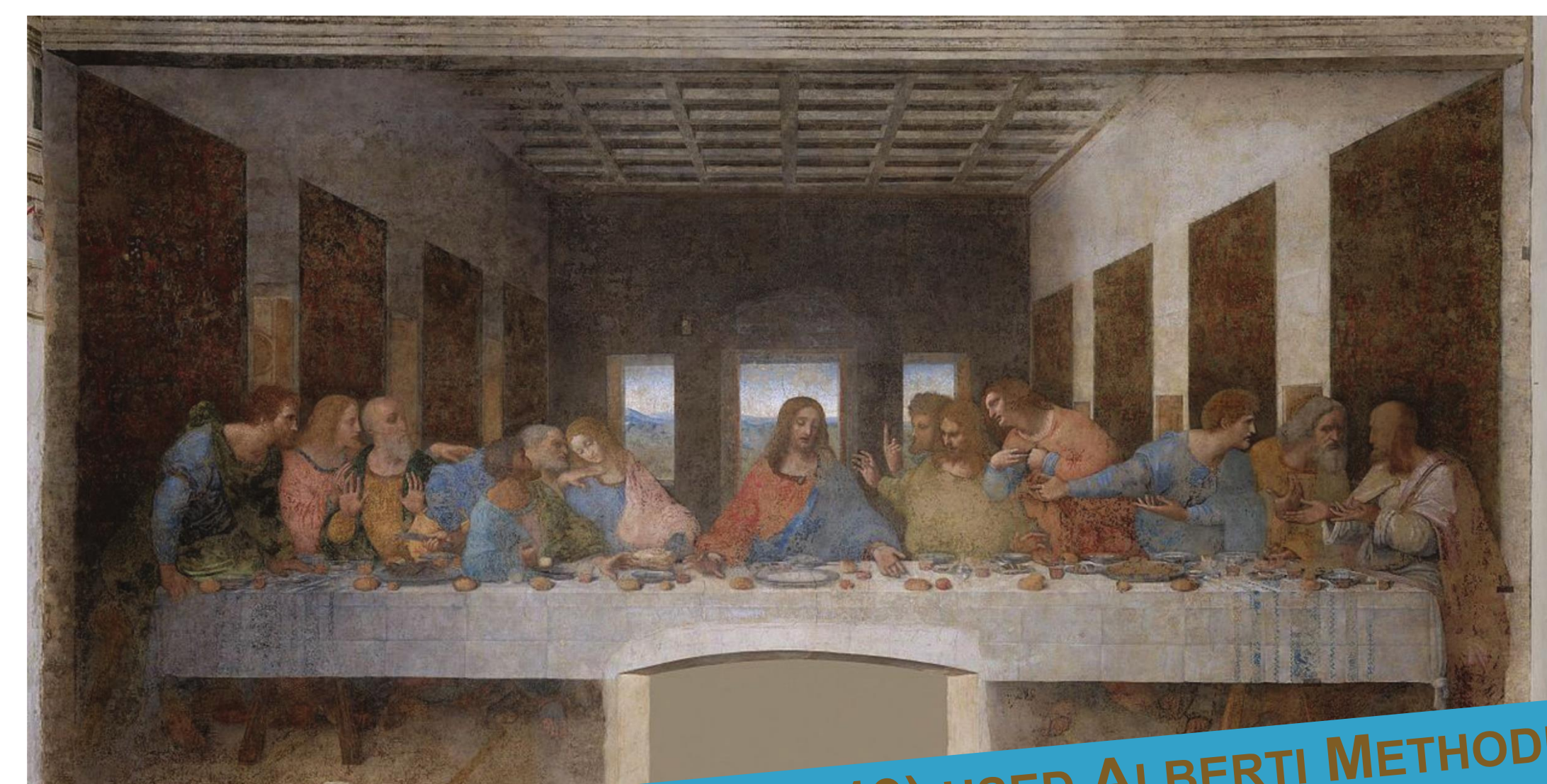
PIERO DELLA FRANCESCA (circa 1416-1492)

He transformed Alberti's solutions into techniques usable by artists in "De Prospectiva Pingendi" published in 1435.



The Ideal City

Often attributed to Pietro Della Francesca



LEONARDO DA VINCI (1452-1519) USED ALBERTI METHODE

The mathematical formalization of the rules of central perspective has enabled the development of further geometrical theories such as projective geometry, non-Euclidean geometries ...

