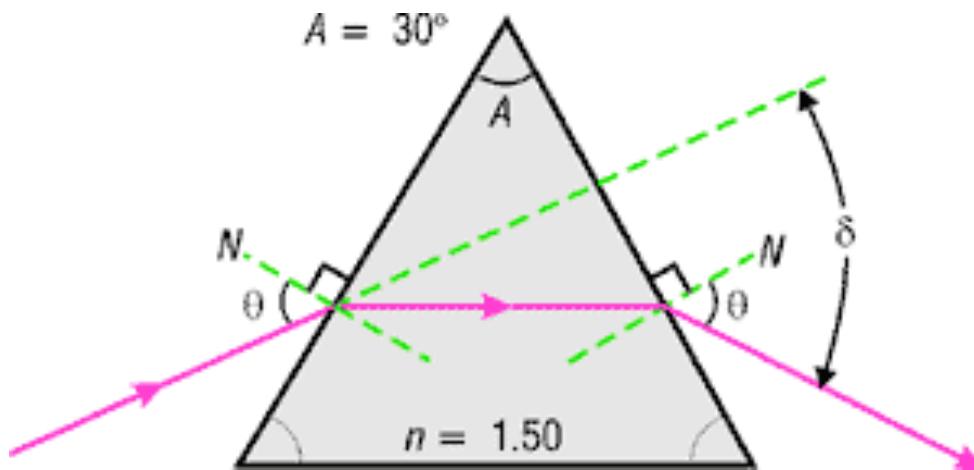


History of Perspective

Projective Geometry
May 2008

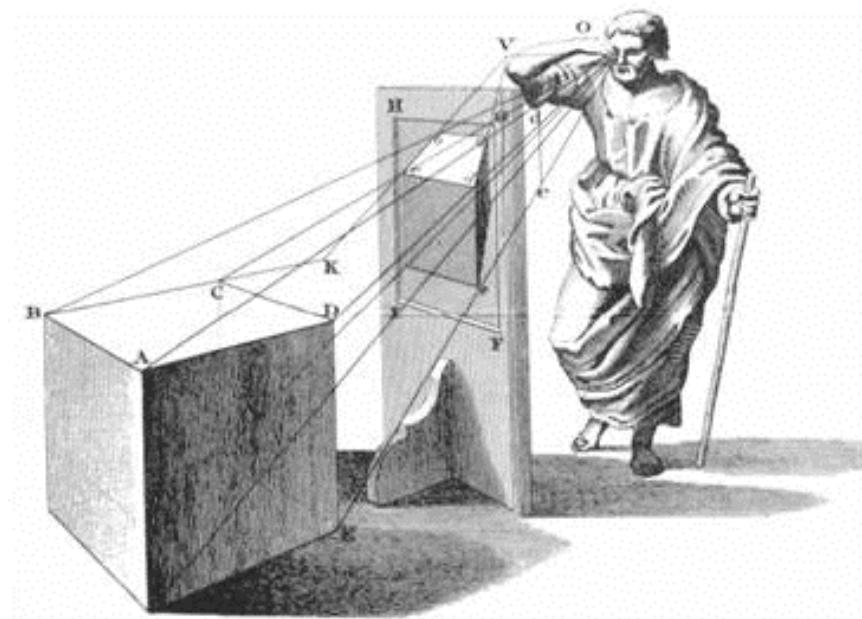
Optics

- The science that describes the behavior and properties of light and the interaction of light with matter.



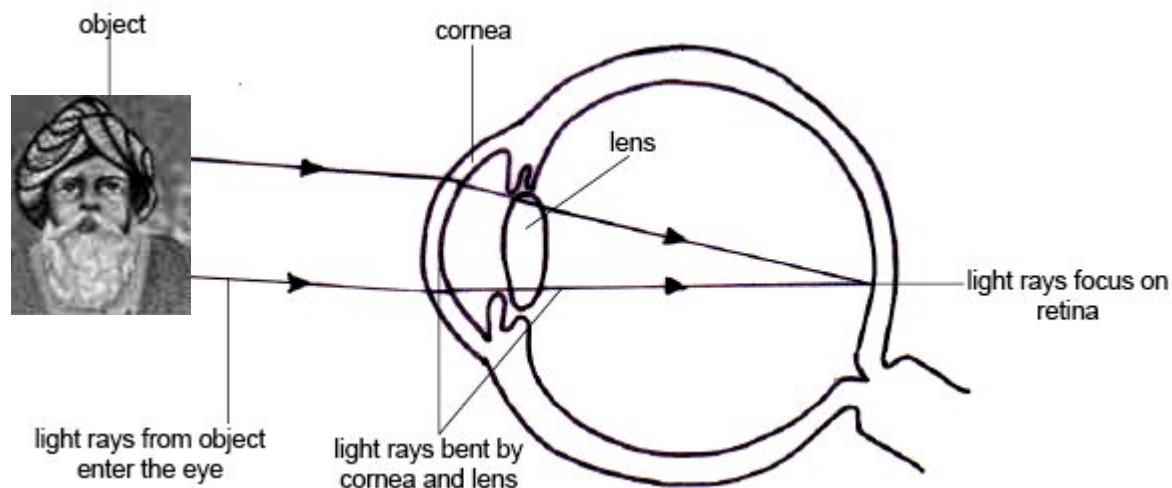
History of Optics

- ~300 BC: Euclid (Alexandria) In his *Optica* he noted that light travels in straight lines and described the law of reflection.
 - believed that vision involves rays going from the eyes to the object seen.
 - studied the relationship between the apparent sizes of objects and the angles that they subtend at the eye.



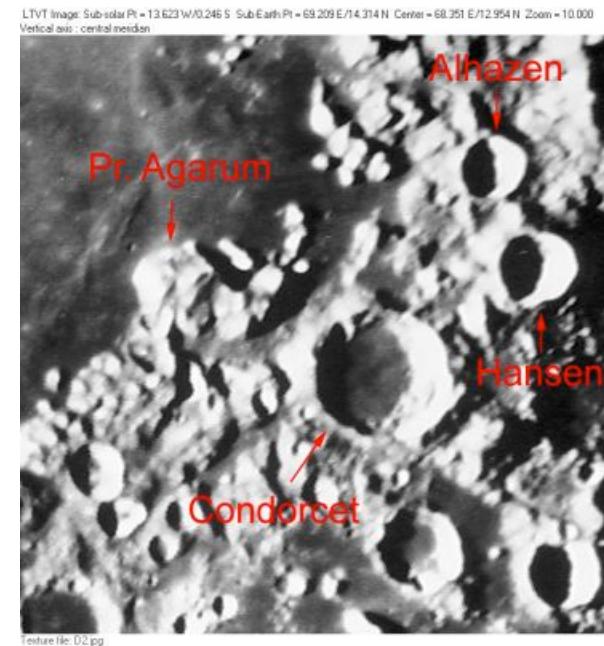
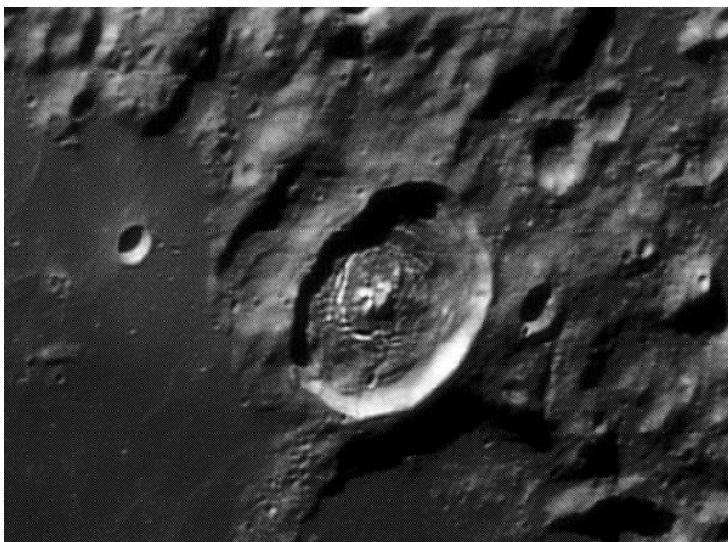
History of Optics

- ~1000 AD: Ibn al-Haytham gave the first correct explanation of vision, showing that light is reflected from an object into the eye.
 - Wrote 7 volume work on Optics, *Kitab al-Manazir*. Translated into Latin in 1270, *Opticae thesaurus Alhazeni*.



History of Optics

- ~1278: Witelo wrote *Perspectiva*, which became the standard text for optics for the next few centuries
 - Largely taken from al-Haytham's work, recently translated
 - Greatly influenced Kepler (of the Laws of Planetary Motion fame) and Leonardo da Vinci
 - Witelo had a moon crater named after him, Vitello



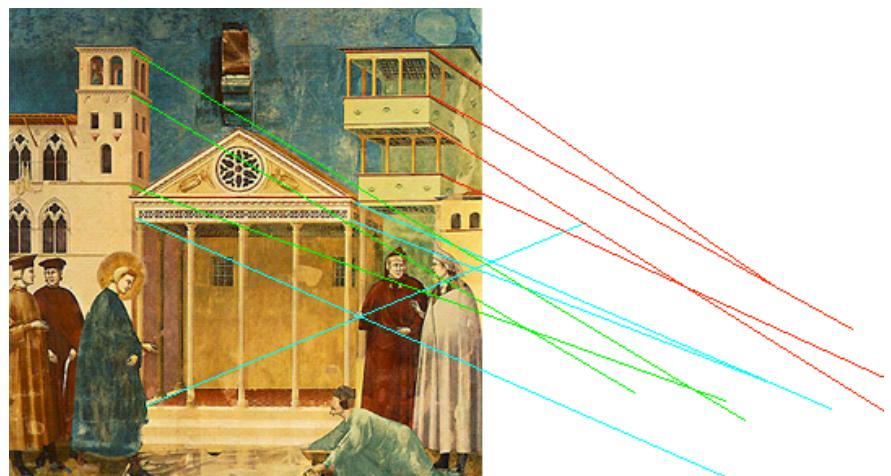
Early Perspective

- ~1000 AD: Master of the Sophien Cathedral of Ohrid, Fresco



Early Perspective

- 1290: Giotto, L'hommage d'un homme simple



Early Perspective

- ~1333: Simone Martini's Passion (or Orsini) Polyptych



Renaissance Perspective

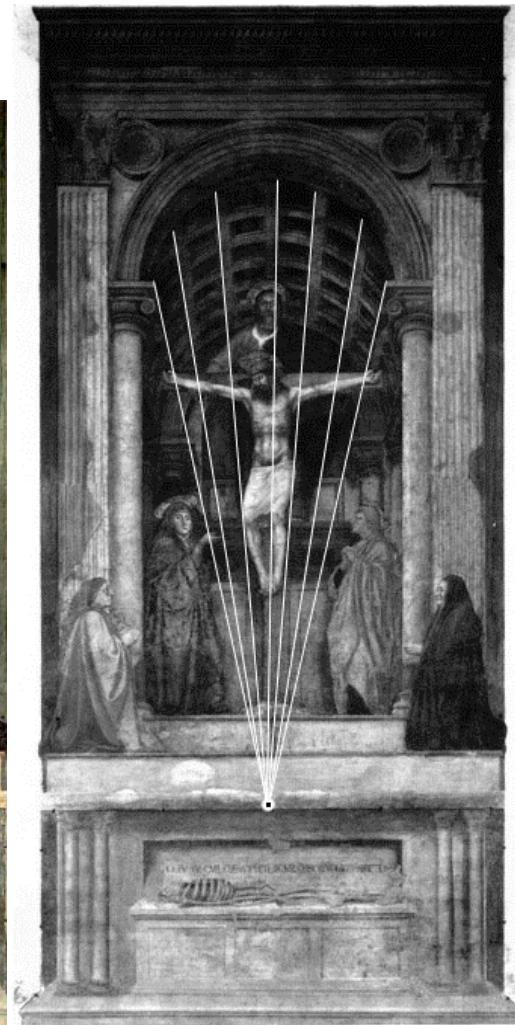
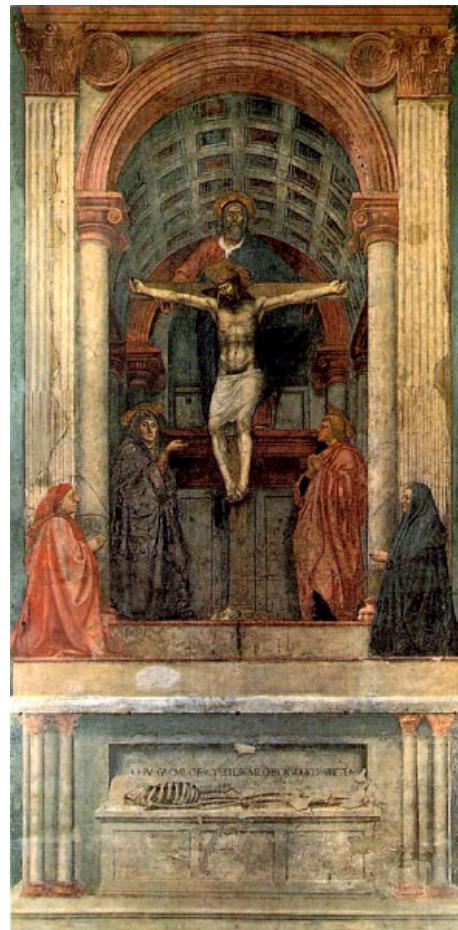
■ Filippo Brunelleschi (1377-1446)

- Inventor of linear perspective
- Architect of dome on Florence Cathedral
- understood that there should be a single vanishing point to which all parallel lines in a plane converge.
- correctly computed the relation between the actual length of an object and its length in the picture depending on its distance behind the plane of the canvas.



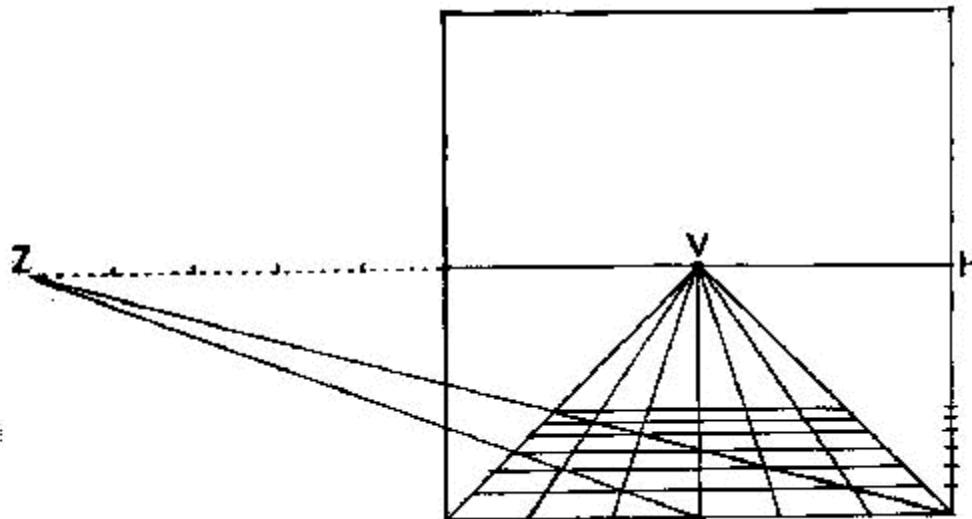
Renaissance Perspective

- 1425: Masaccio, Holy Trinity



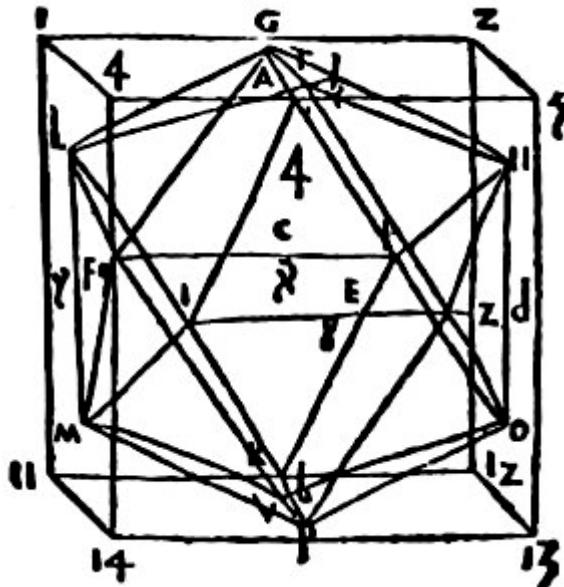
Renaissance Perspective

- 1435: Alberti wrote De Pictura
- De pictura is in three parts, the first of which gives the mathematical description of perspective which Alberti considers necessary to a proper understanding of painting.



Renaissance Perspective

- 1410-1492: Piero Della Francesca
- Artist and mathematician, painted famous work as well as write mathematics texts



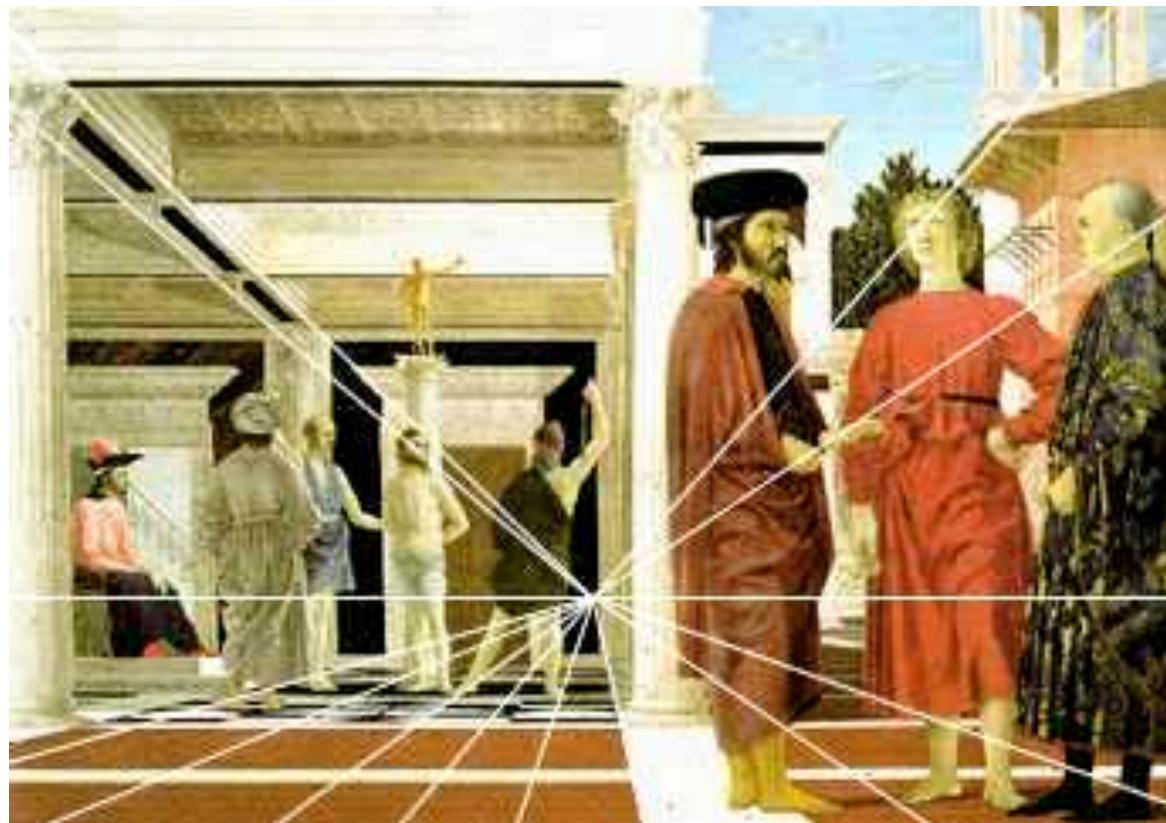
icosahedron inscribed in a cube,
from text: *Libellus De Quinque
Corporibus Regularibus*,



~1460 Flagellation of Christ

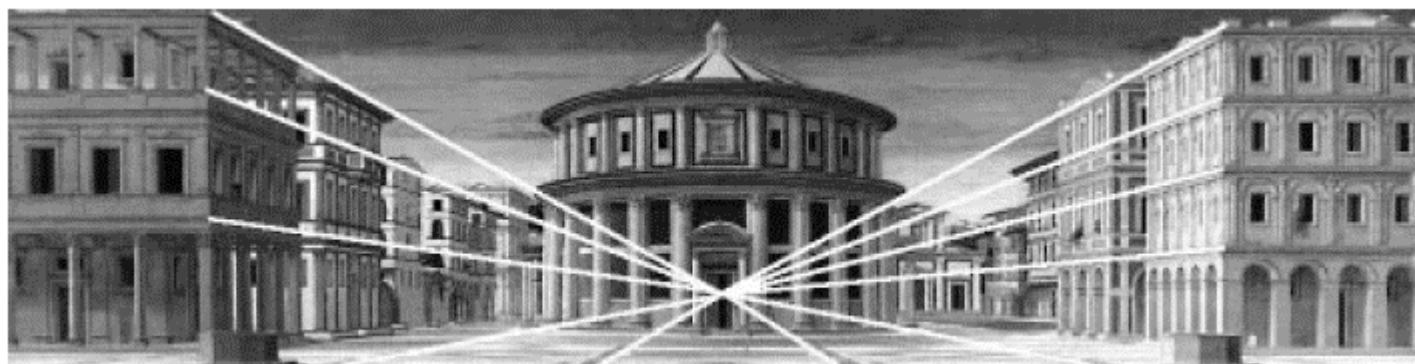
Renaissance Perspective

~1460, Piero Della Francesca, Flagellation of Christ



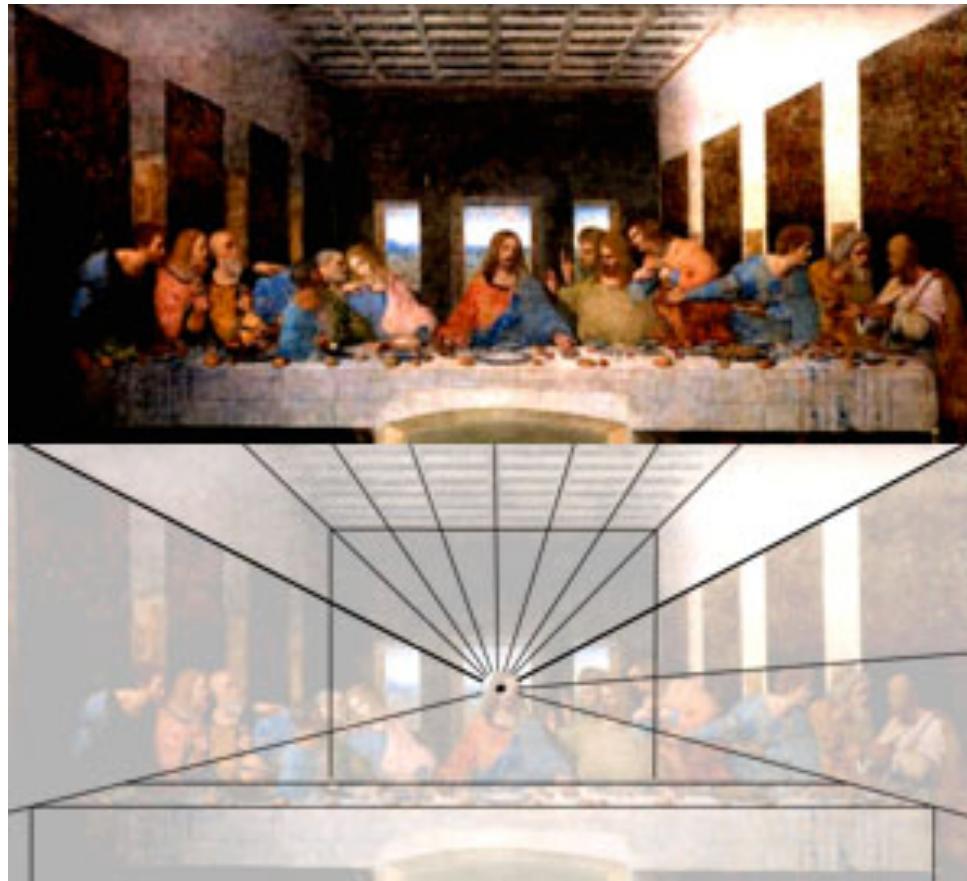
Renaissance Perspective

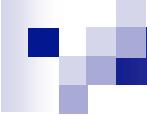
- ~1470: Piero Della Francesca, Ideal City



Renaissance Perspective

- ~1498: Leonardo da Vinci, The Last Supper





Historical context

- ~1439: Gutenberg invented moveable type printing
- ~1480: Beginning of Renaissance Humanism, a return to primary sources, study of Latin and Greek texts
- ~1492: Age of Exploration: de Gama and Columbus go exploring
- ~1517: Protestant Reformation: Luther challenges the Pope's authority
- ~1543: Scientific Revolution: Copernicus displaced earth as the center of the universe

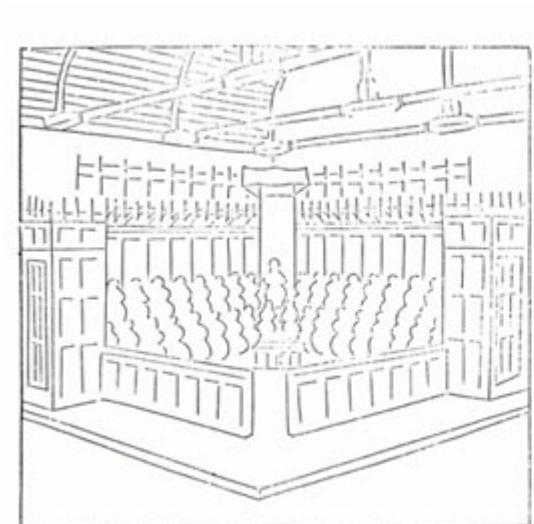
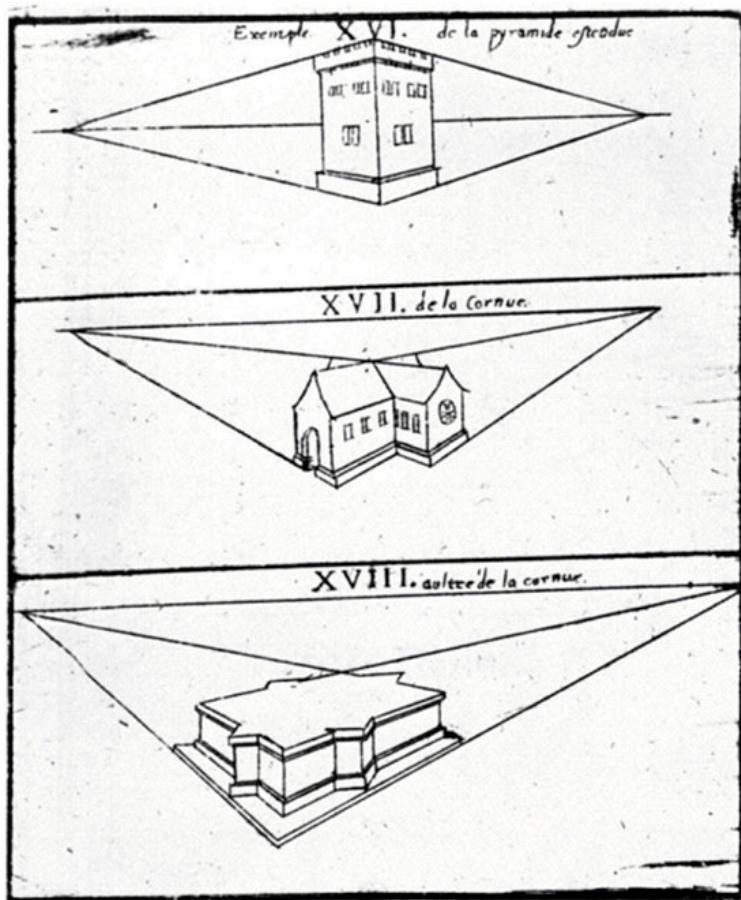
Renaissance Perspective

- 1518: Raphael, The School of Athens



2-Point Perspective

- 1505: Pélérin, first known diagrams of 2-point perspective in his book, *De Artificiali Perspectiva*



A council of governance
For the sovereign of France

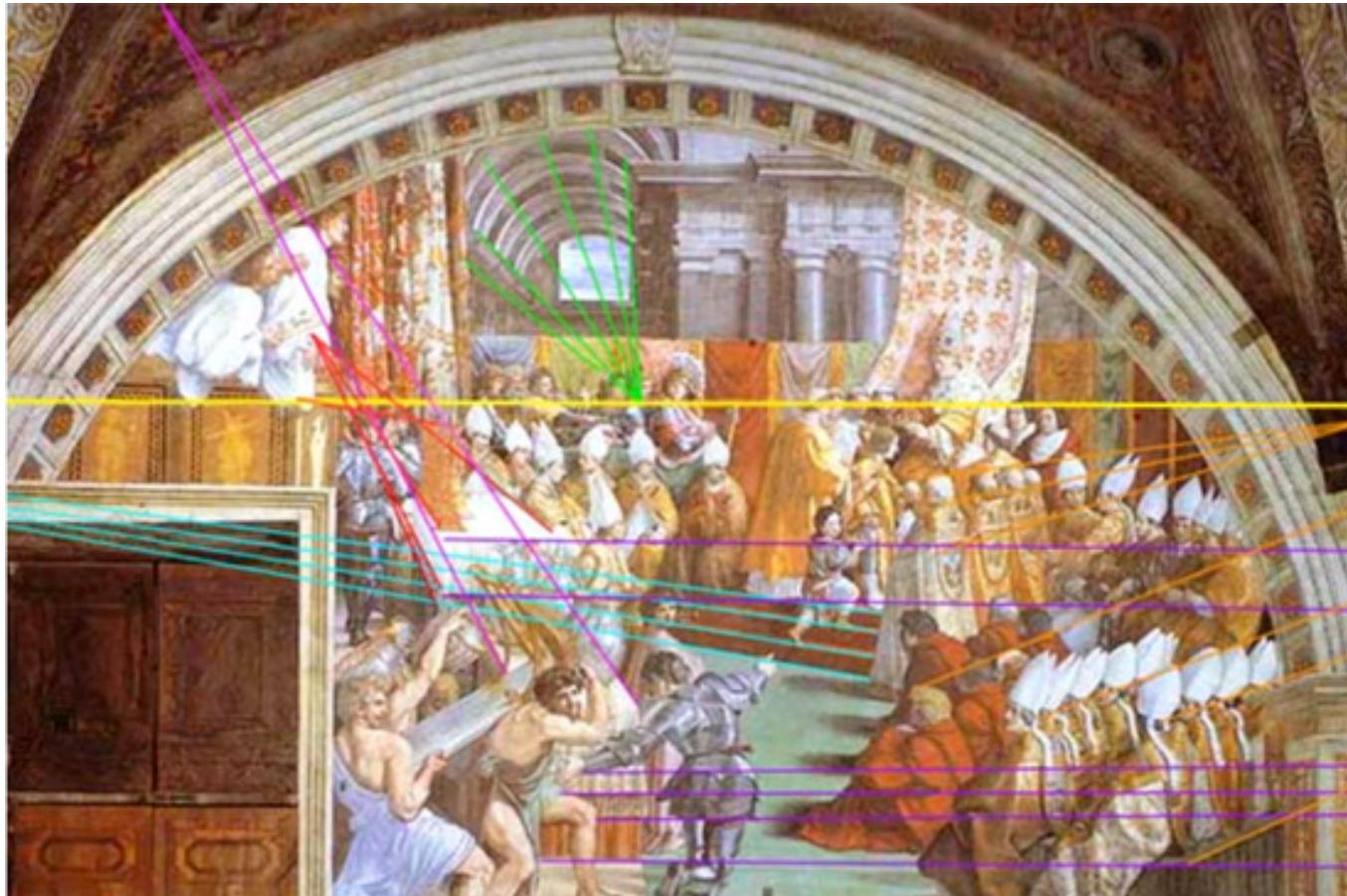
2-Point Perspective

- 1517: Raphael, Coronation of Charlemagne



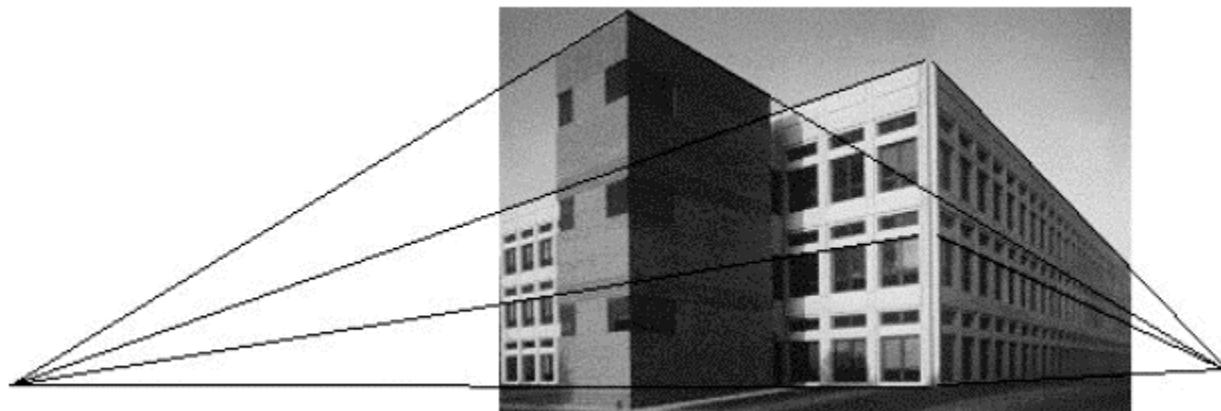
2-Point Perspective

- 1517: Raphael, Coronation of Charlemagne





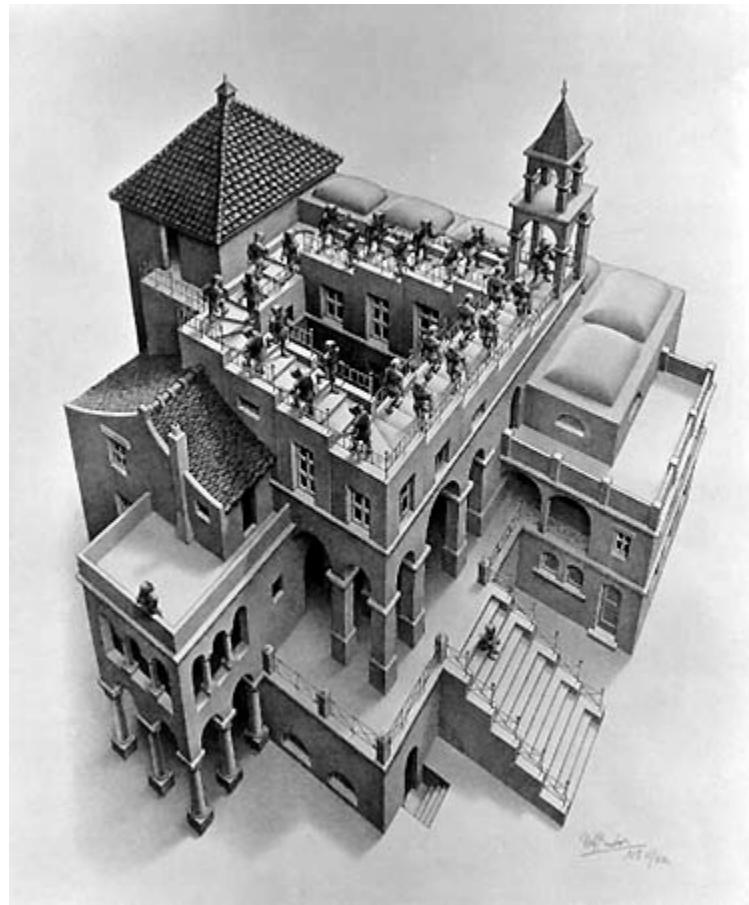
2-Point Perspective



<http://visualeditors.ning.com/video/video/show?id=1985197%3AVideo%3A9529>

3-Point Perspective

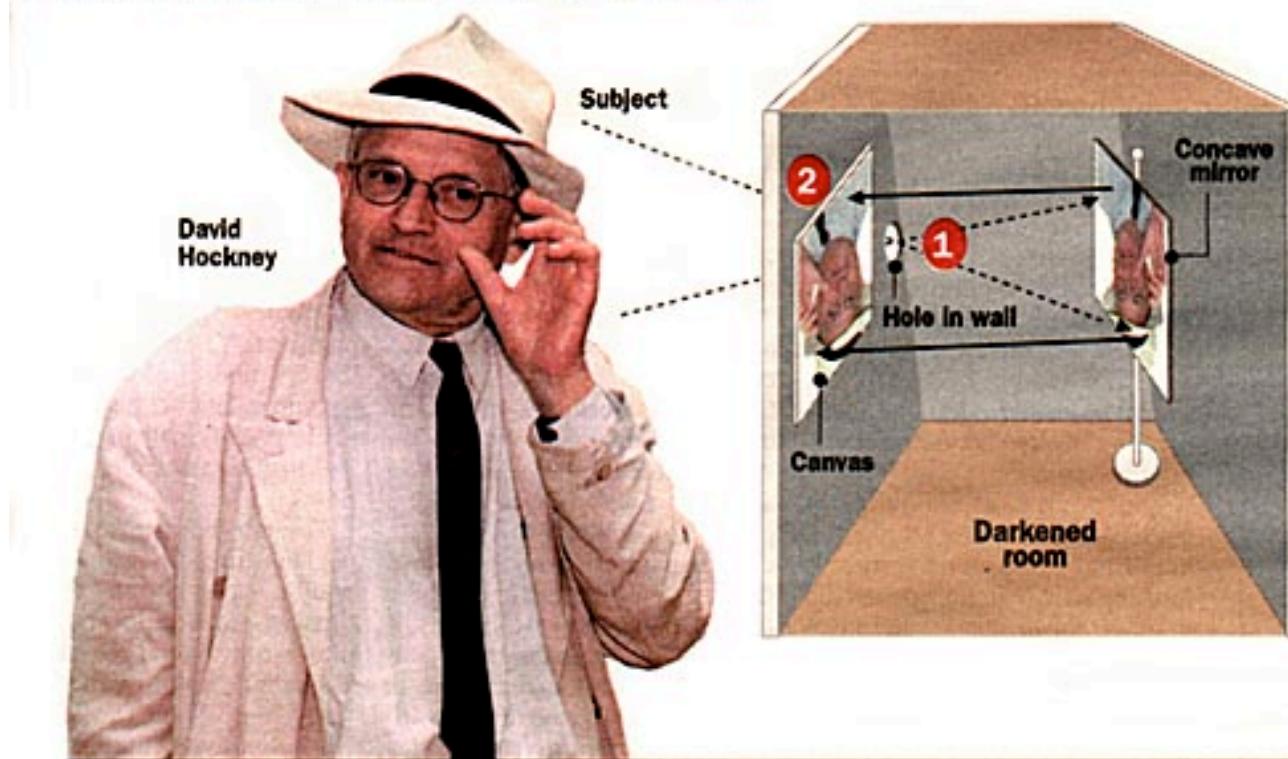
- 1960: M.C. Escher, Ascending and Descending



Camera Obscura, Anamorphism

- David Hockney (1937-) believes that the Old Masters, including Caravaggio, Vermeer, Holbein, Ingres, etc. used the camera obscura to paint with perfect accuracy.

How the Camera Obscura Works



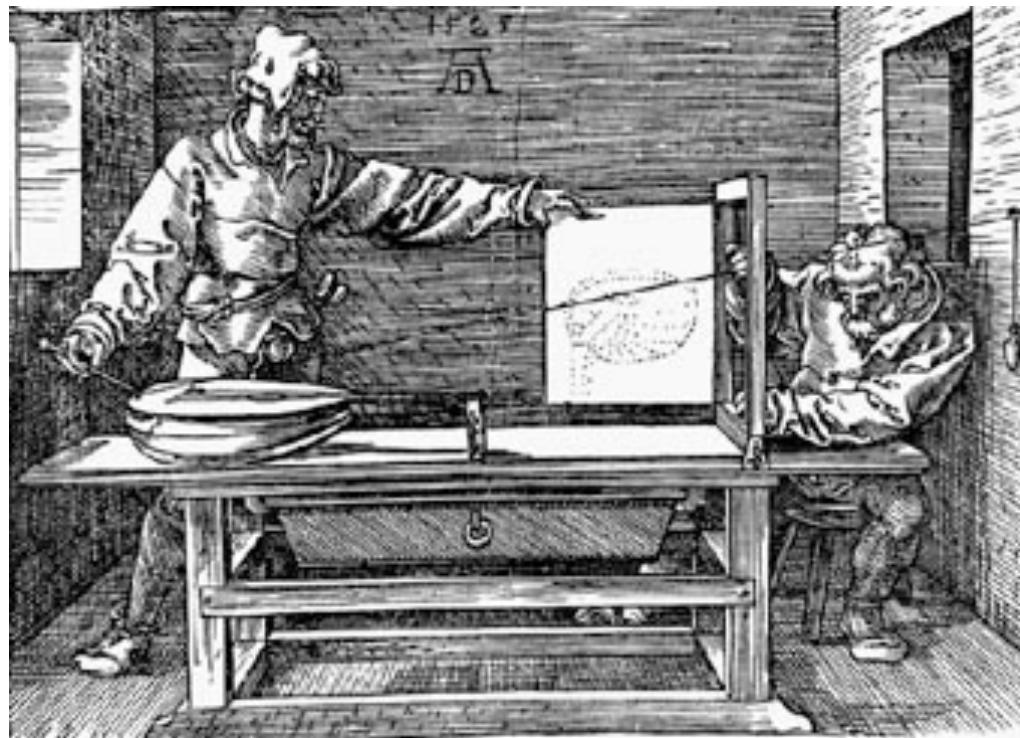
1. In one approach, the image of a subject passes through a small opening in the wall of a darkened room onto a mirror.

2. The image is reflected off the mirror onto a canvas or piece of paper hung on the opposite wall. The image is now traced. Then the canvas can be turned right side up and the work finished from real life.

Photo by Associated Press; Los Angeles Times graphic

Renaissance Perspective

- 1525: Albrecht Dürer, Instruction How to Measure with Compass and Straight Edge



Camera Obscura, Anamorphism

- 1533: Hans Holbein the Younger, The Ambassadors



Hockney believes Hans Holbein the Younger may have used **camera obscura** to paint certain objects in the room, including

- the lute
- the globe
- the music written in the books
- the drapery

Camera Obscura, Anamorphism

- 1533: Hans Holbein the Younger, The Ambassadors



Play on Perspective

- 1754: William Hogarth, False Perspective



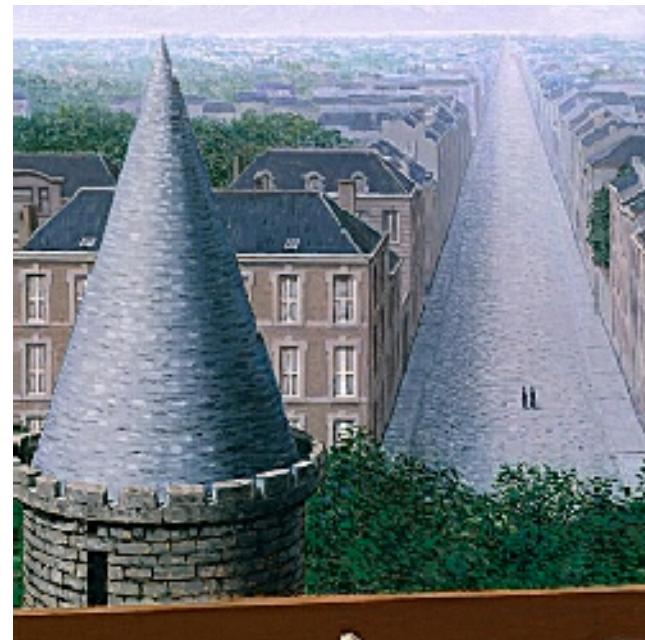
Play on Perspective

- 1914: Giorgio di Chirico, Melancholy and Mystery of a Street



Play on Perspective

- 1955: Rene Magritte, Promenades of Euclid



Multiple Viewpoints

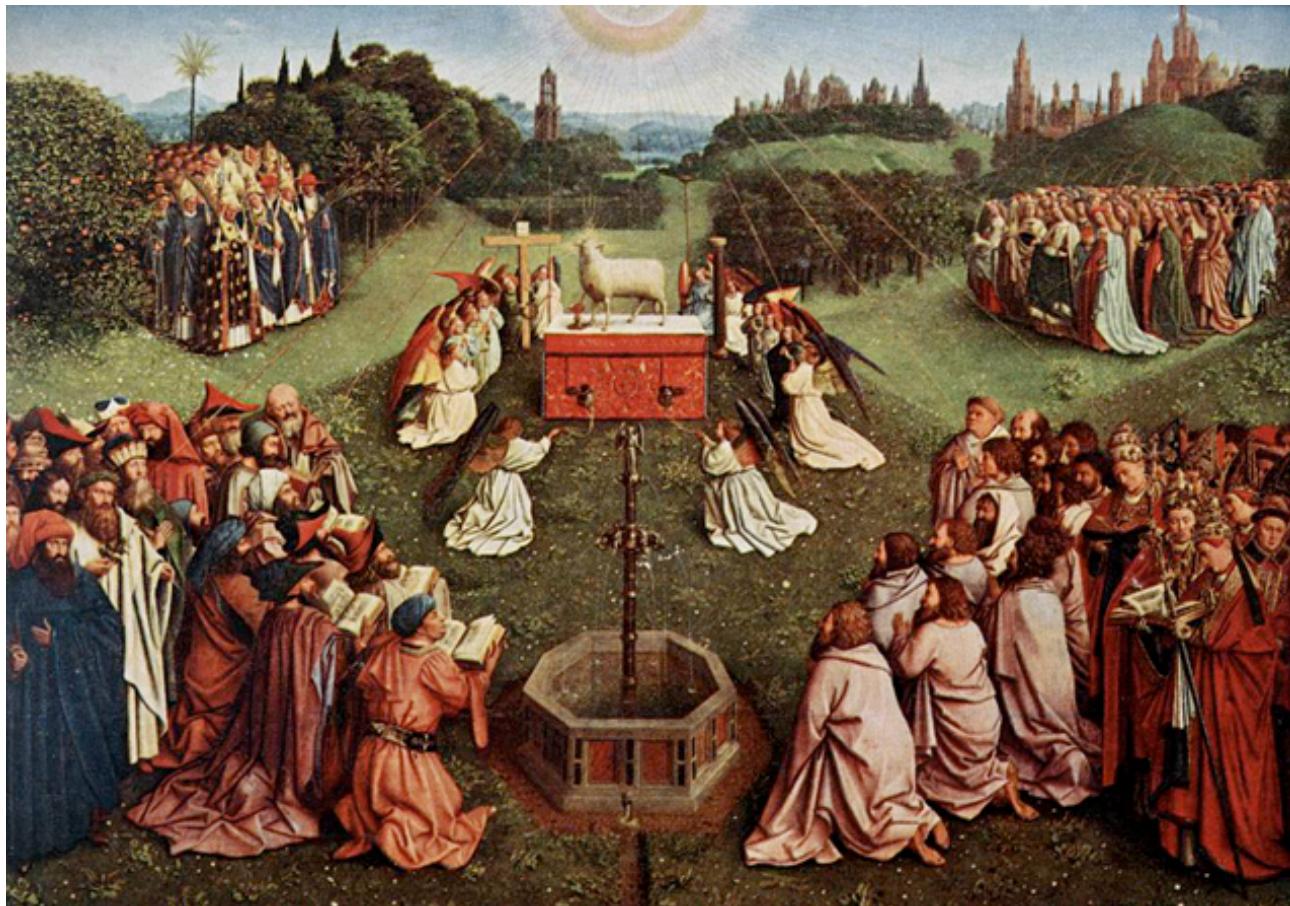
- 1986: David Hockney, Pearblossom Highway



©2000 JPC

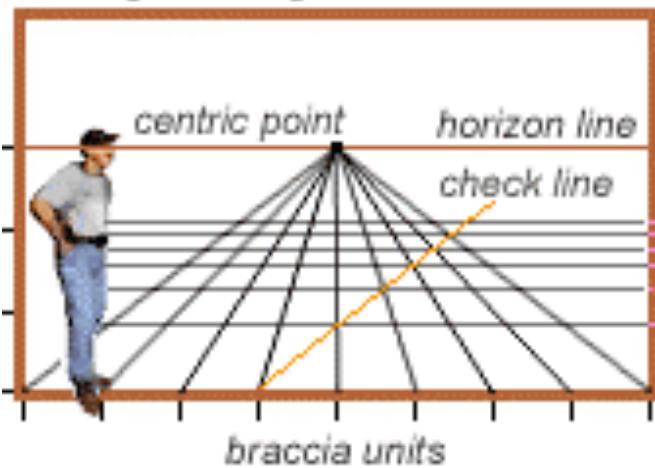
Multiple Viewpoints

- 1432: Jan van Eyck, Ghent Altarpiece

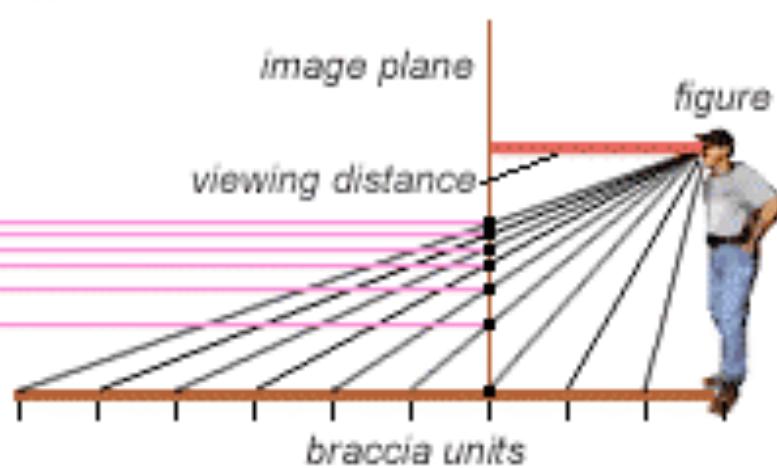


one point perspective

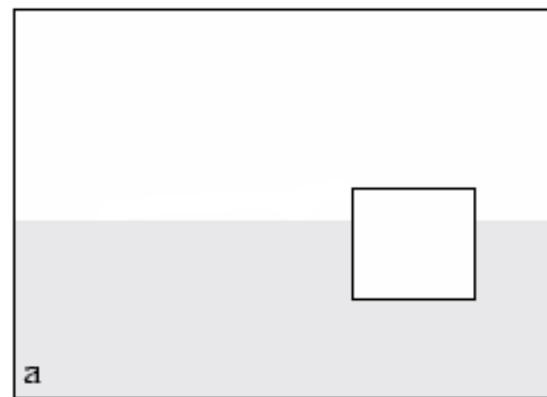
A image rectangle



B transversal construction

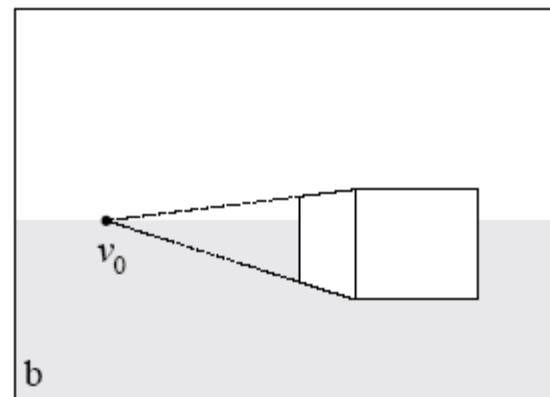


How to draw a house and fence



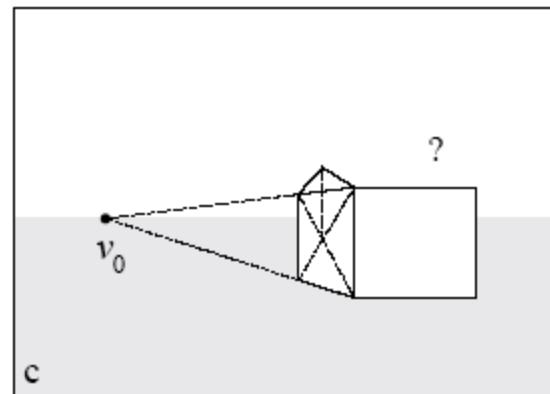
- Draw the front of the house.

How to draw a house and fence



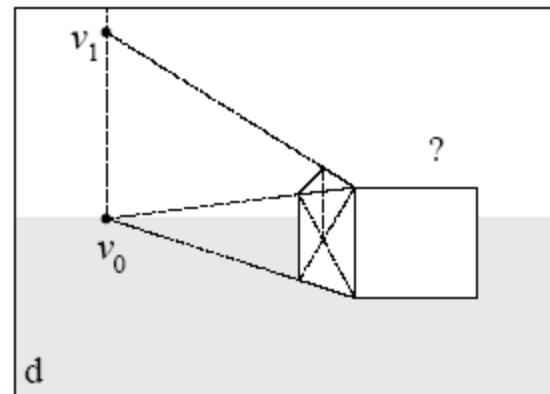
- Indicate a vanishing point, draw the side of the house.

How to draw a house and fence



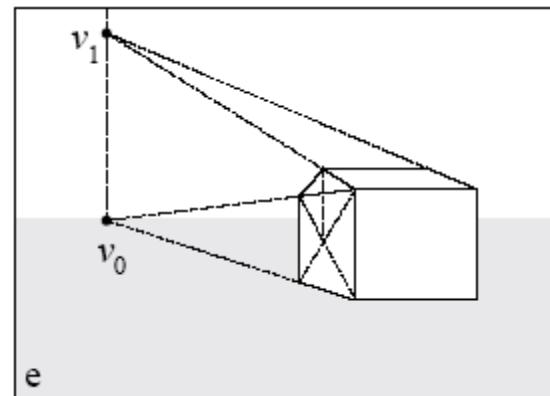
- Find the center of the wall by drawing an X, draw roof.
- How do we draw the roof on the other side?

How to draw a house and fence

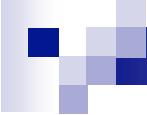


- Follow the side of the roof to a point directly above v_0 .

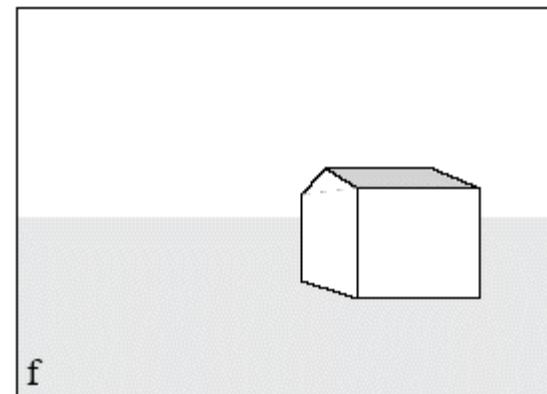
How to draw a house and fence



- That is the second vanishing point for the other roof.

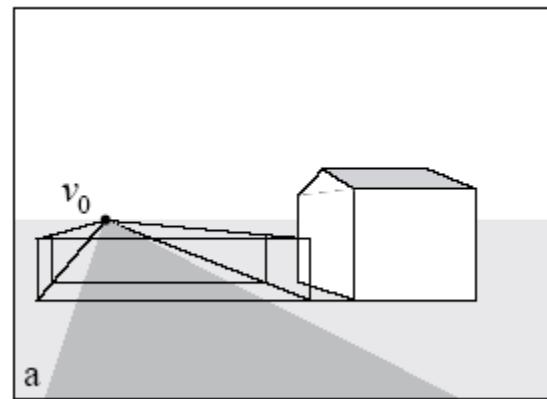


How to draw a house and fence



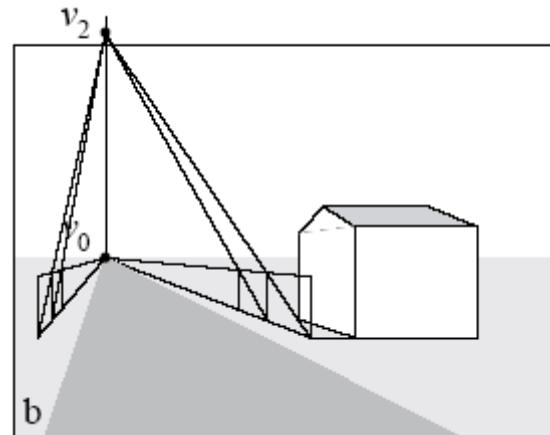
- Nice house!

How to draw a house and fence



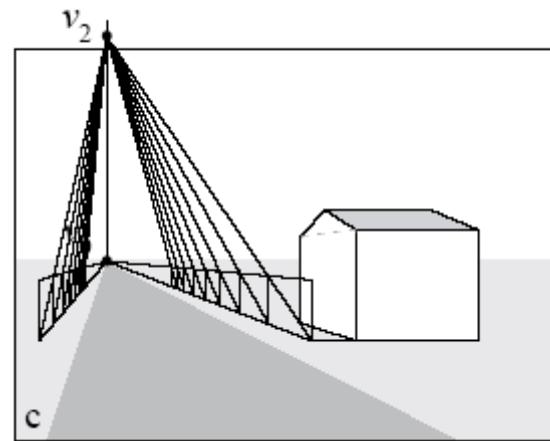
- The house is on the side of the road. Draw the road.

How to draw a house and fence



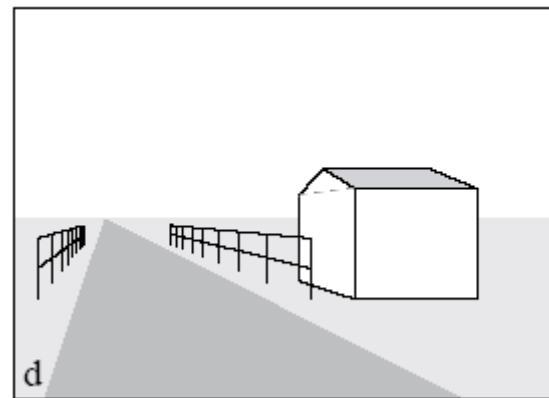
- To make a fence along the road, draw a second vanishing point using diagonals.
- Draw the other fence posts.

How to draw a house and fence



- Nice fence posts!

How to draw a house and fence



- What a lovely house and fence in perspective.