Perspective through the Renaissance

CS 48N, Winter 2011

Marc Levoy

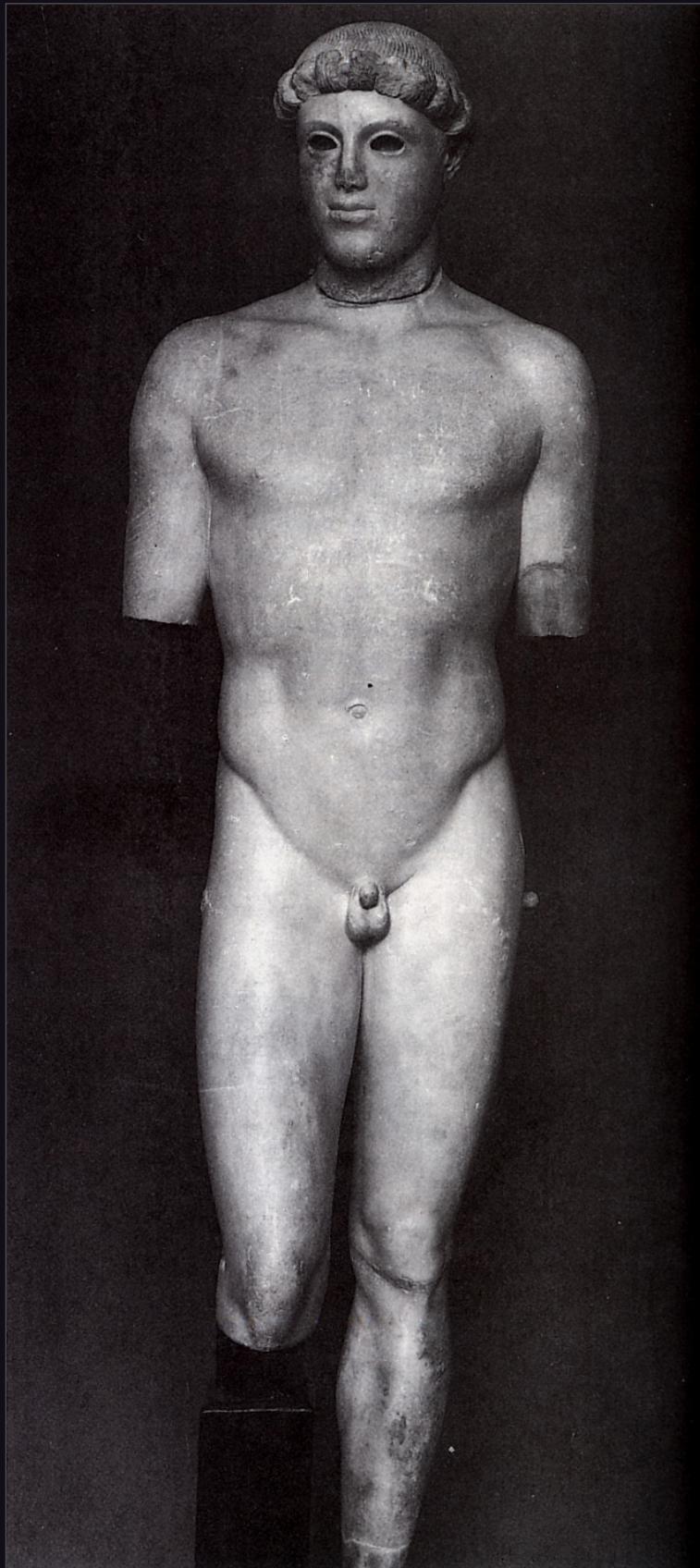Computer Science Department
Stanford University

Greek Kouros statue
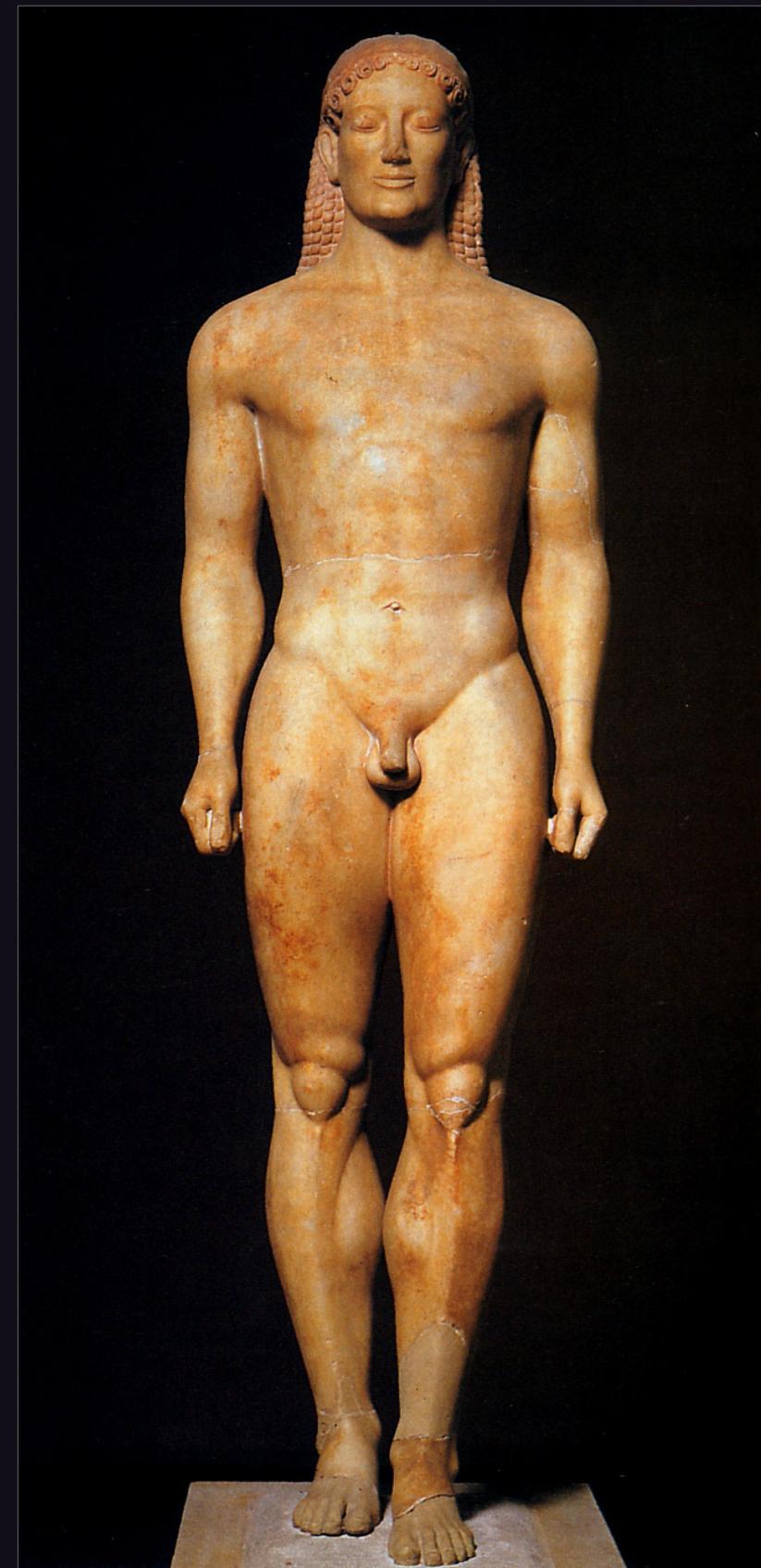(circa 600 BC)

Greek Kouros statue
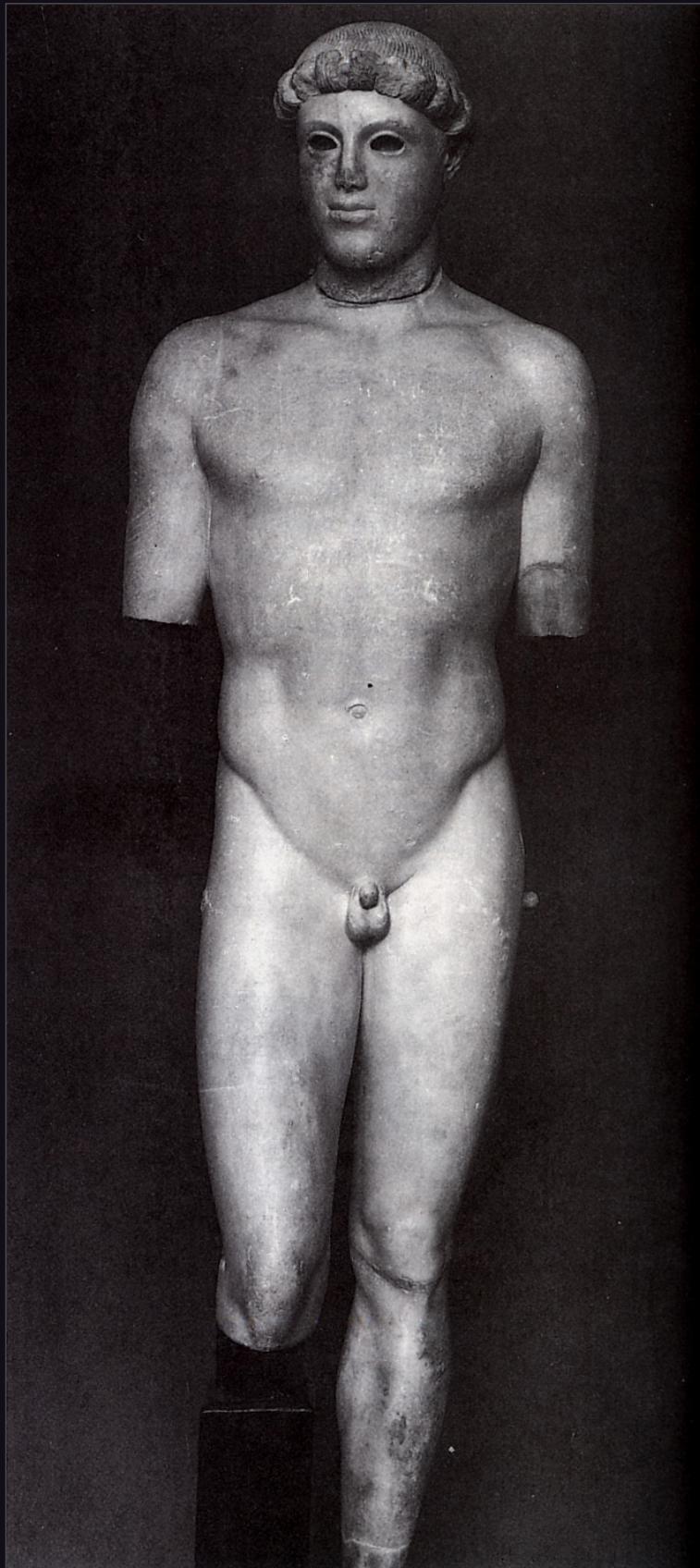(circa 600 BC)

Greek Kouros statue
(circa 530 BC)

Greek Kouros called
the Kritian Boy
(circa 480 BC)

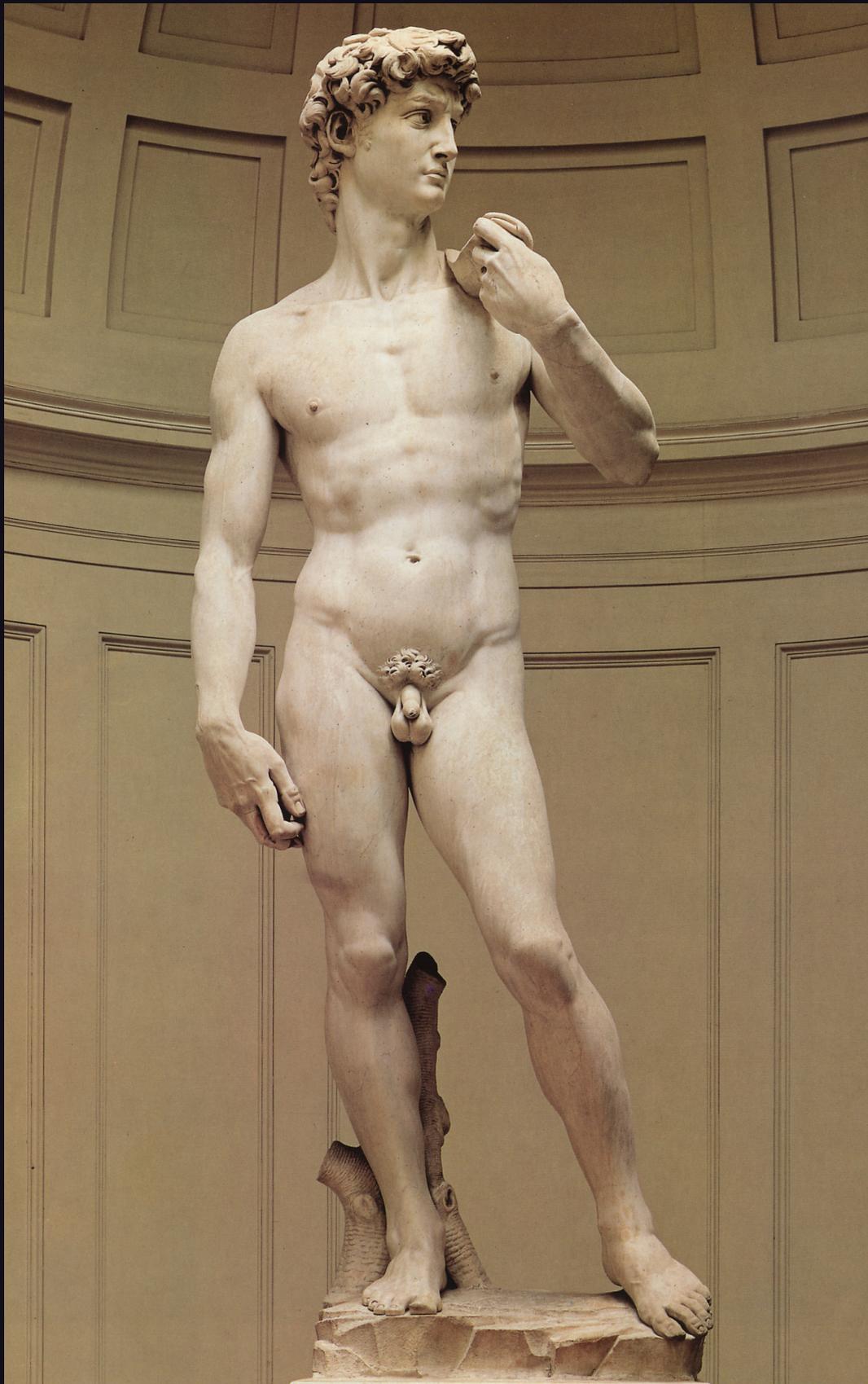Greek Kouros statue
(circa 530 BC)

Greek Kouros called
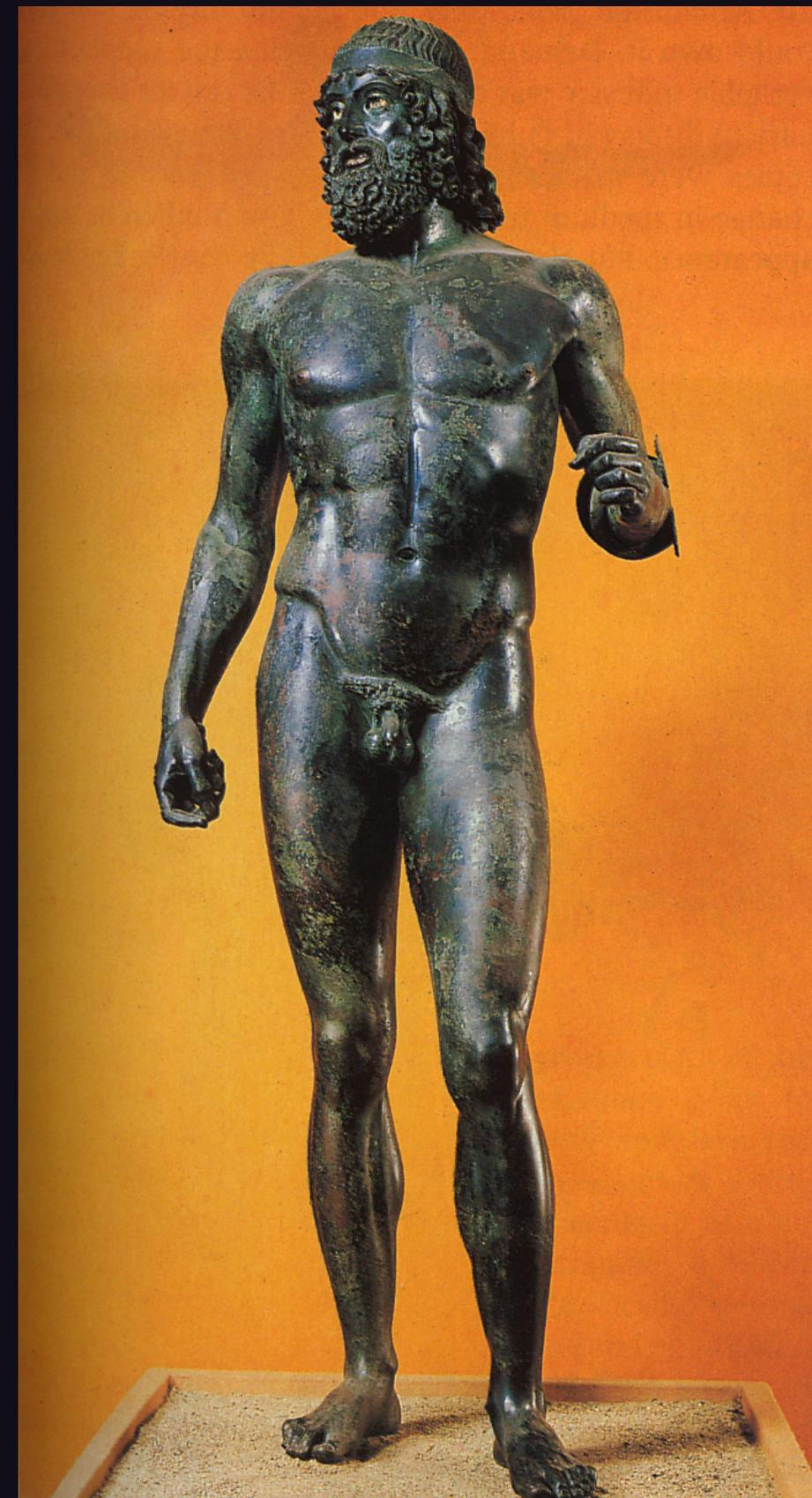the Kritian Boy
(circa 480 BC)

Warrier, uncovered in
Riace (circa 450 BC)

Michelangelo,
David (1504)
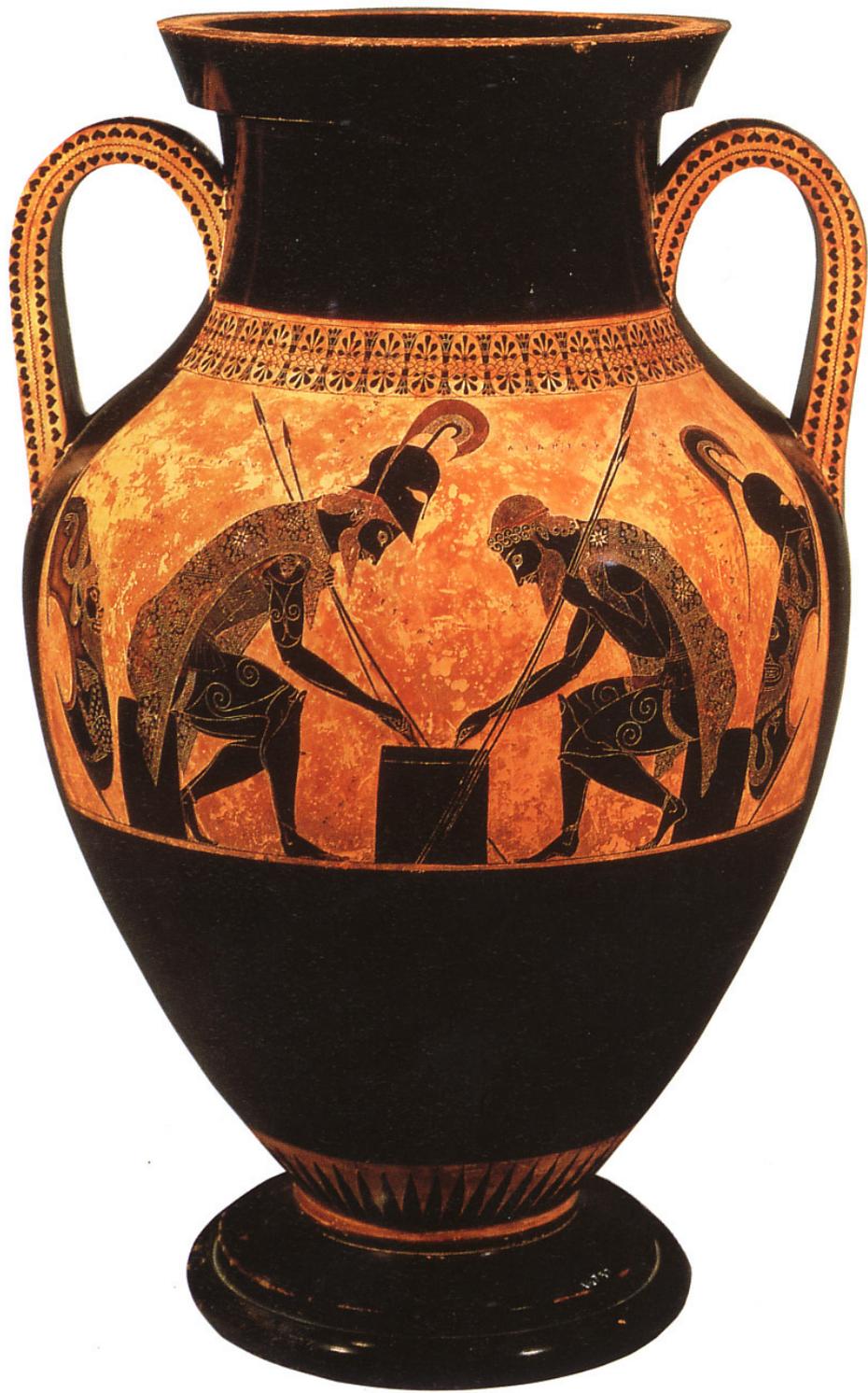
Warrier, uncovered in
Riace (circa 450 BC)

Greek vase,
black-figured style
(circa 540 BC)

Greek vase,
red-figured style
(circa 500 BC)

Greek vase,
black-figured style
(circa 540 BC)

Greek vase,
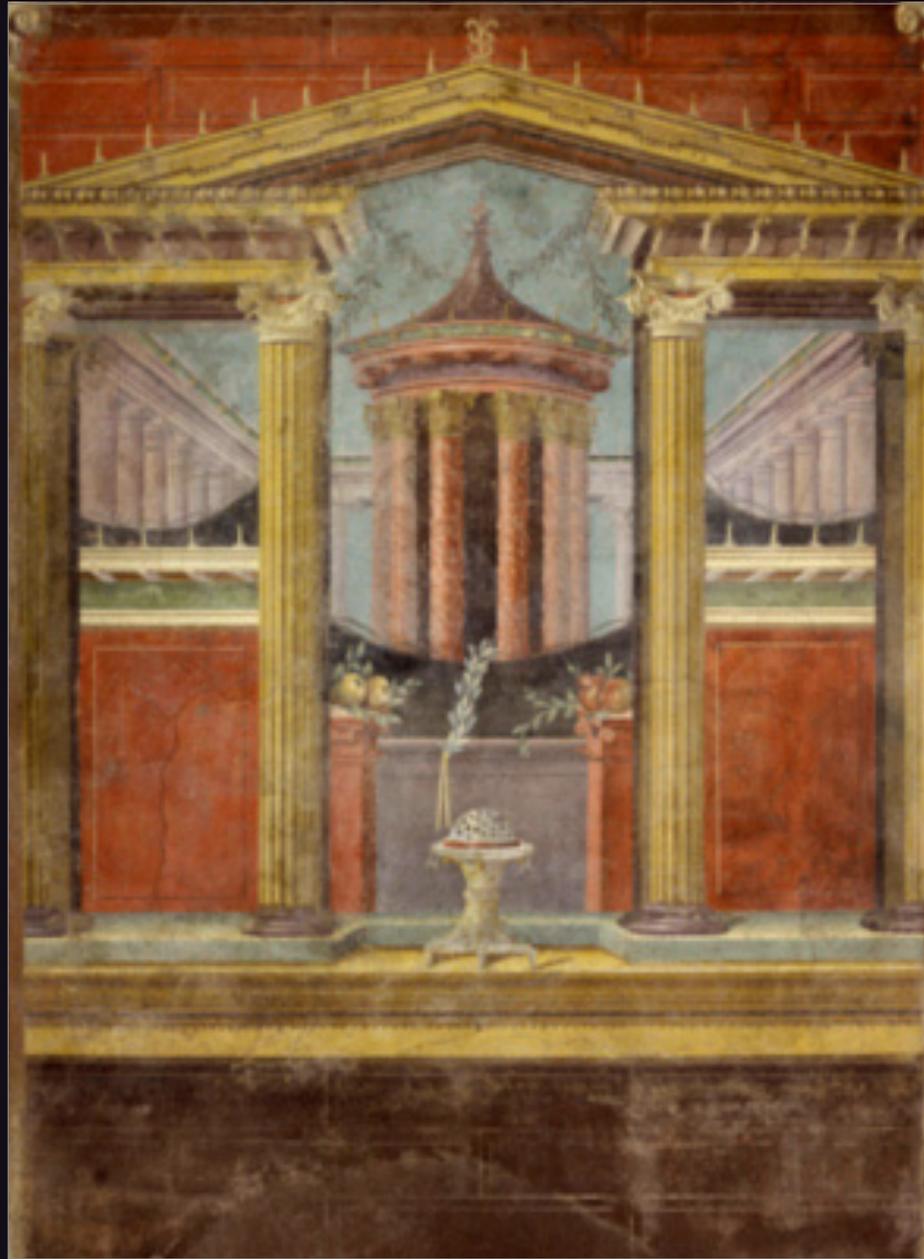red-figured style
(circa 500 BC)

Gerome, *Pygmalion and Galatea* (c. 1890)

Fowling scene, Nebamun's Tomb (1400 BC)

George Catlin, Little Bear (1842)

Roman wall painting in "second style",
from Villa Publius Fannius Synistor,
Boscoreale, Pompeii (c. 40 B.C.)

Roman wall painting in "fourth style",
from Herculaneum (before 79 A.D.)

Mosaic, Saint Apollinare Nuovo, Ravenna (504 AD)

Mosaic, San Vitale, Ravenna (547 AD)

Duccio, Virgin and Child Enthroned with Saints, Maesta Alterpiece, Siena (1311)

Giotto, Faith, Arena Chapel, Padua (1305)

The Mourning of Christ

Giotto, Faith, Arena Chapel, Padua (1305)
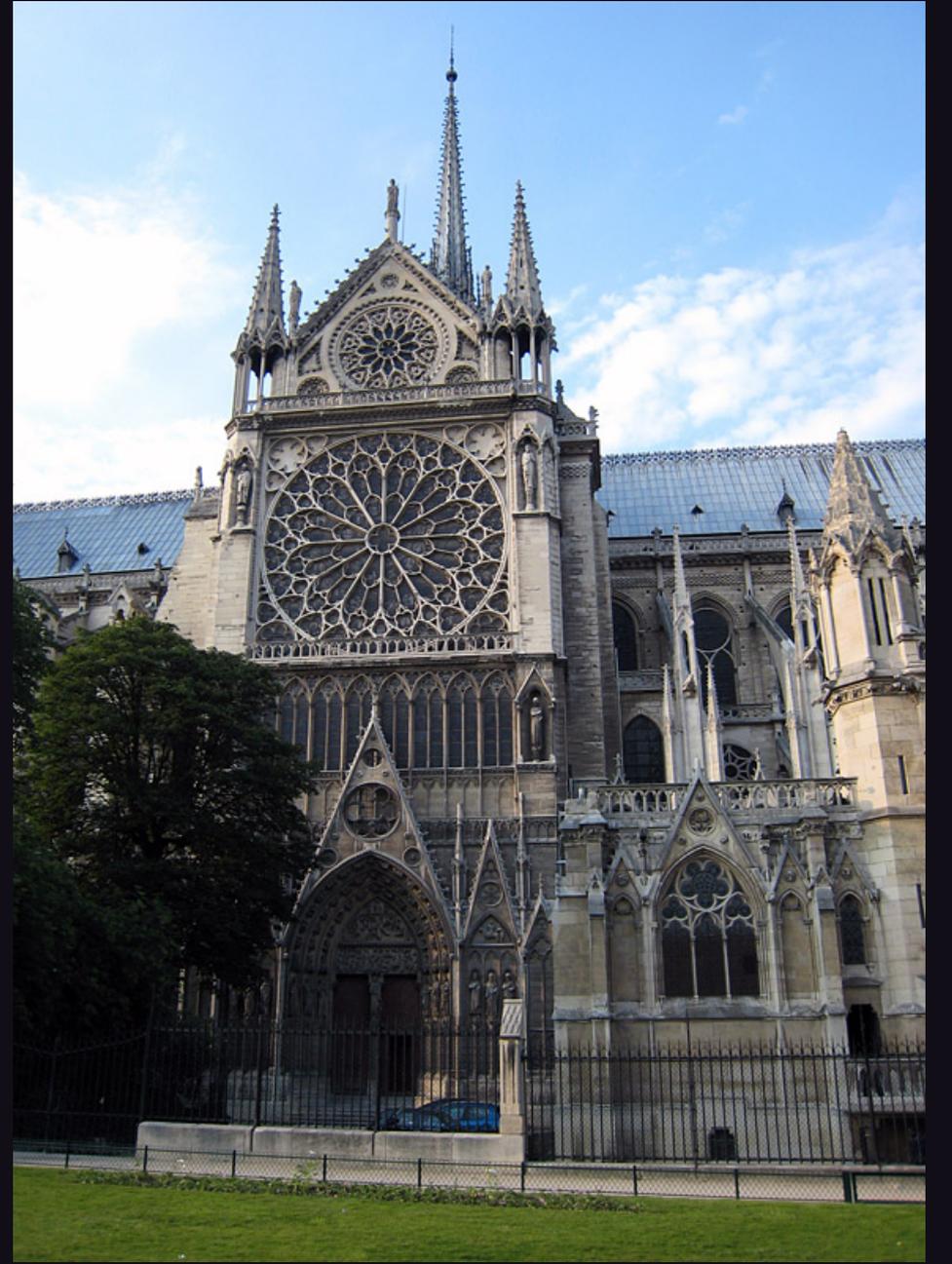
Donatello, David
(1432)

Brunelleschi, Ospedale degli Innocenti
(Foundling Hospital), Florence (1424)

Brunelleschi, Ospedale degli Innocenti
(Foundling Hospital), Florence (1424)

Notre Dame, Paris, 12th century

Brunelleschi, Ospedale degli Innocenti
(Foundling Hospital), Florence (1424)

Brunelleschi, dome of the cathedral,
Florence (1436)

flying buttresses

Brunelleschi, dome of the cathedral, Florence (1436)

The laws of perspective

- common assumptions

  1. Light leaving an object travels in straight lines.

The laws of perspective

❖ common assumptions

1. Light leaving an object travels in straight lines.

2. These lines converge to a point at the eye.

The laws of perspective

* common assumptions

    1. Light leaving an object travels in straight lines.

    2. These lines converge to a point at the eye.

* natural perspective   (Euclid, 3rd c. B.C.)

    3a. More distant objects subtend smaller visual angles.

The laws of perspective

❖ common assumptions

 1. Light leaving an object travels in straight lines.
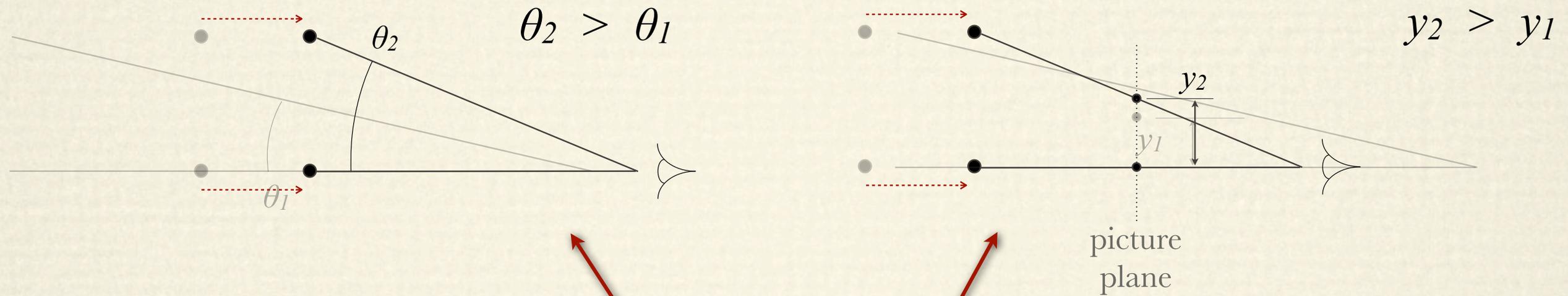
 2. These lines converge to a point at the eye.

❖ natural perspective (Euclid, 3rd c. B.C.)

 3a. More distant objects subtend smaller visual angles.

❖ linear perspective (Brunelleschi, 1413)

 3b. A perspective image is formed by the intersection
 of these lines with a "picture plane" (the canvas).

The laws of perspective

$\theta_2 > \theta_1$

$y_2 > y_1$

picture plane

❖ natural perspective (Euclid, 3rd c. B.C.)

3a. More distant objects subtend smaller visual angles.

❖ linear perspective (Brunelleschi, 1413)

3b. A perspective image is formed by the intersection of these lines with a "picture plane" (the canvas).
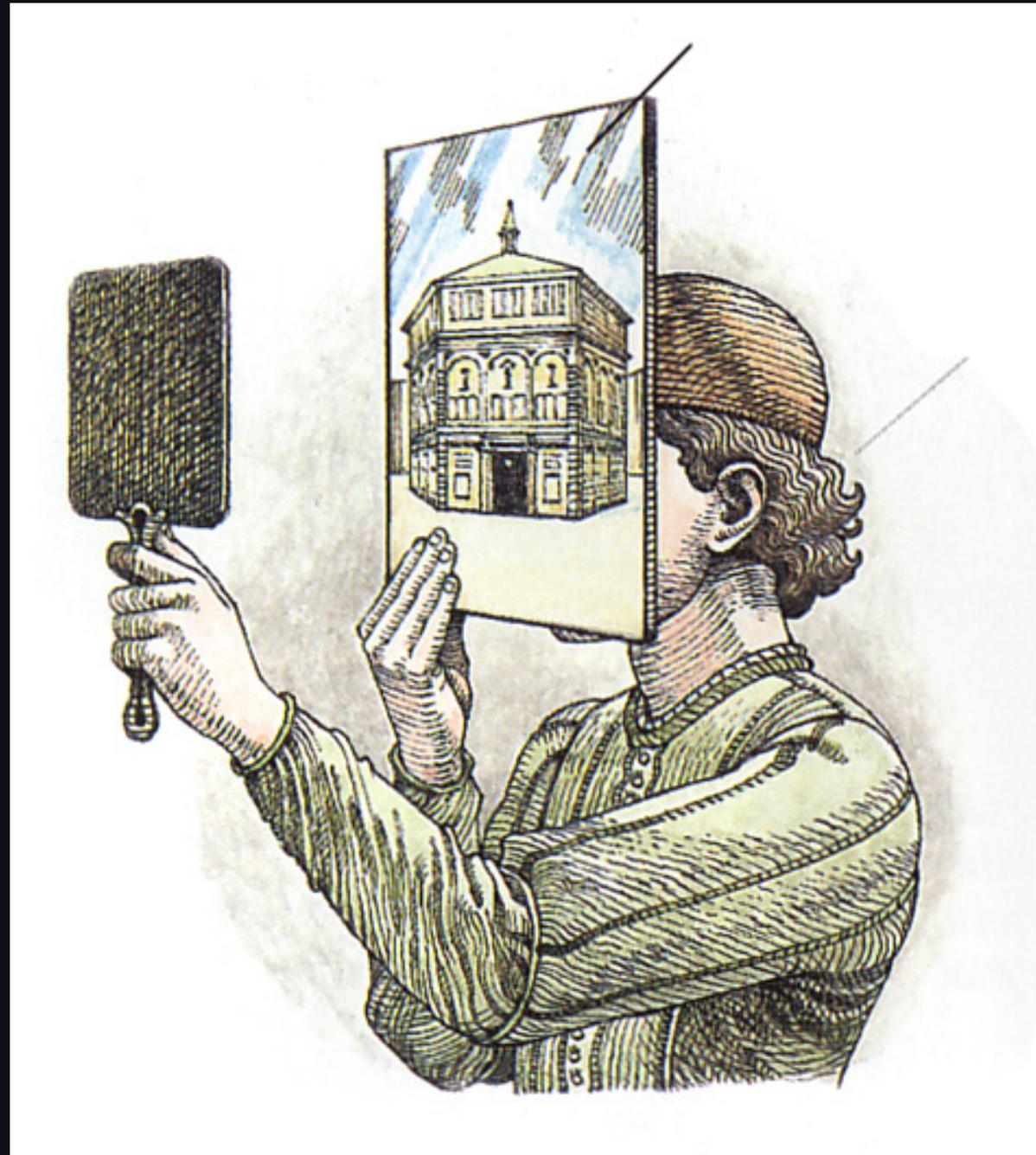
reconstruction of Brunelleschi's lost 1413 perspective drawing
of the Florence Baptistry

Giovanni de Paolo, Birth of St. John the Baptist (c. 1420)
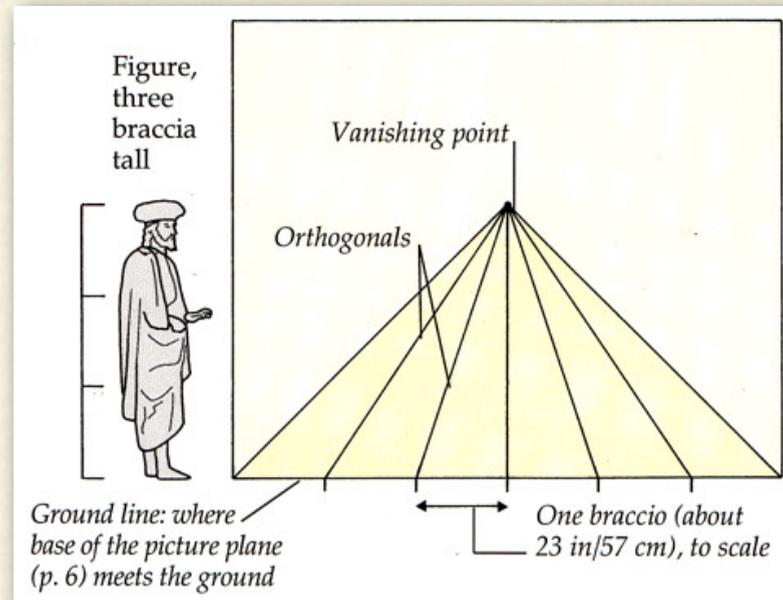
Alberti's method (1435)
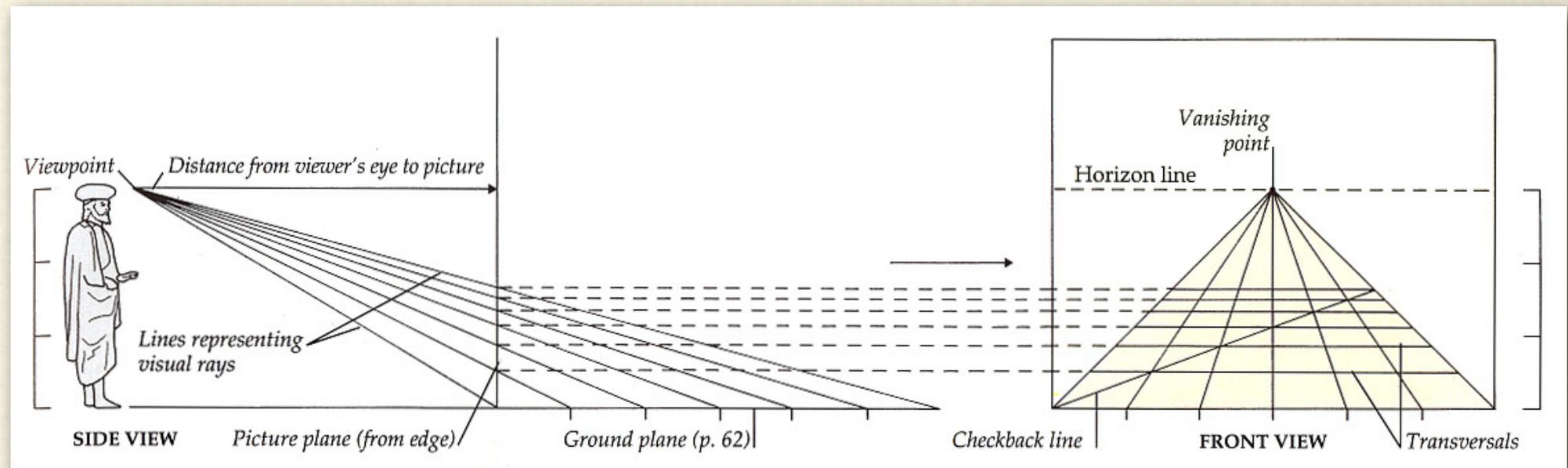
step 1: drawing the orthogonals
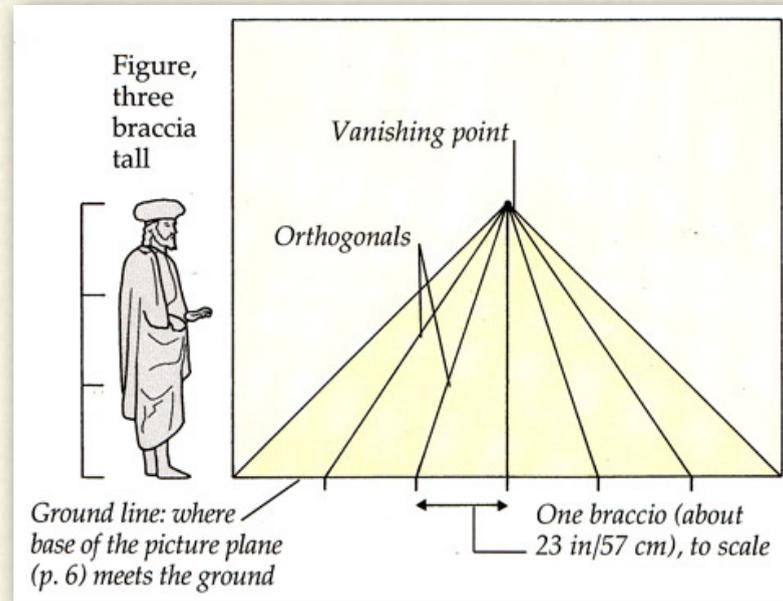
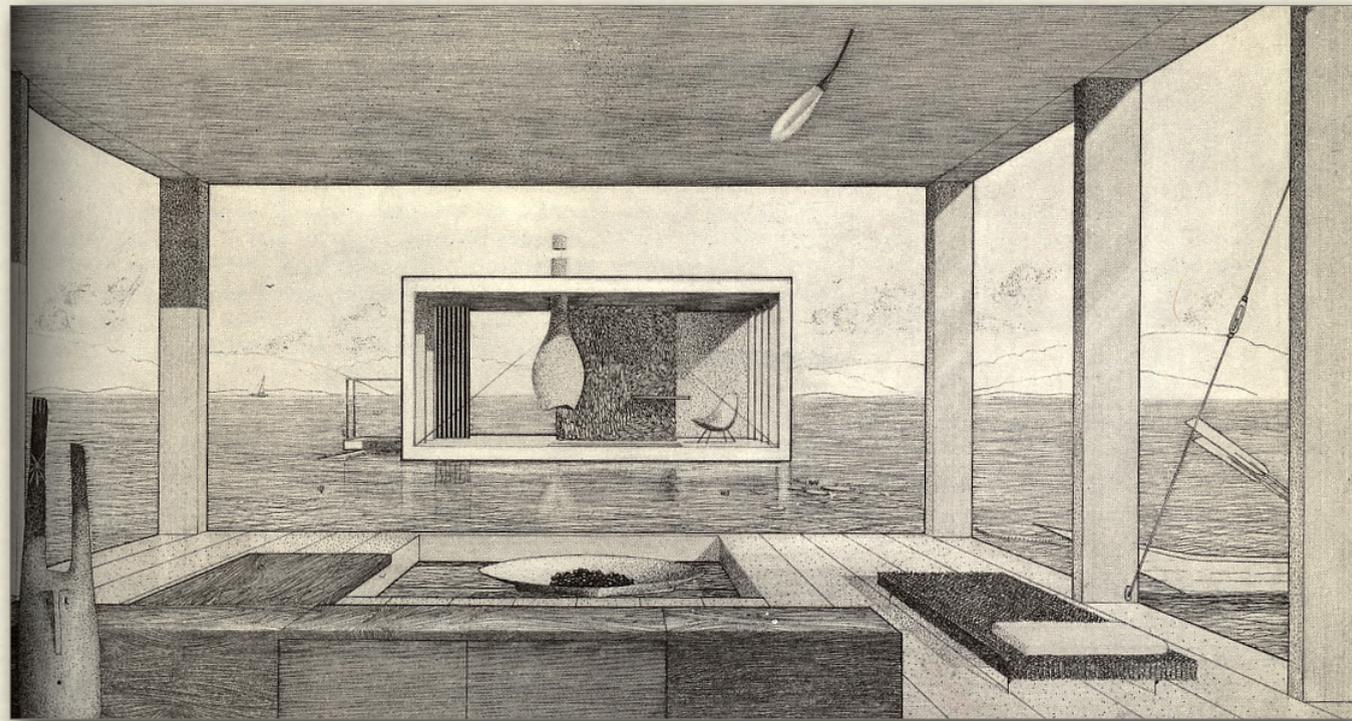(drawings from A. Cole)

Alberti's method (1435)

(drawings from A. Cole)

❖ step 1: drawing the orthogonals

❖ step 2: drawing the transversals

Vanishing points

(drawings by J. D'Amelio)

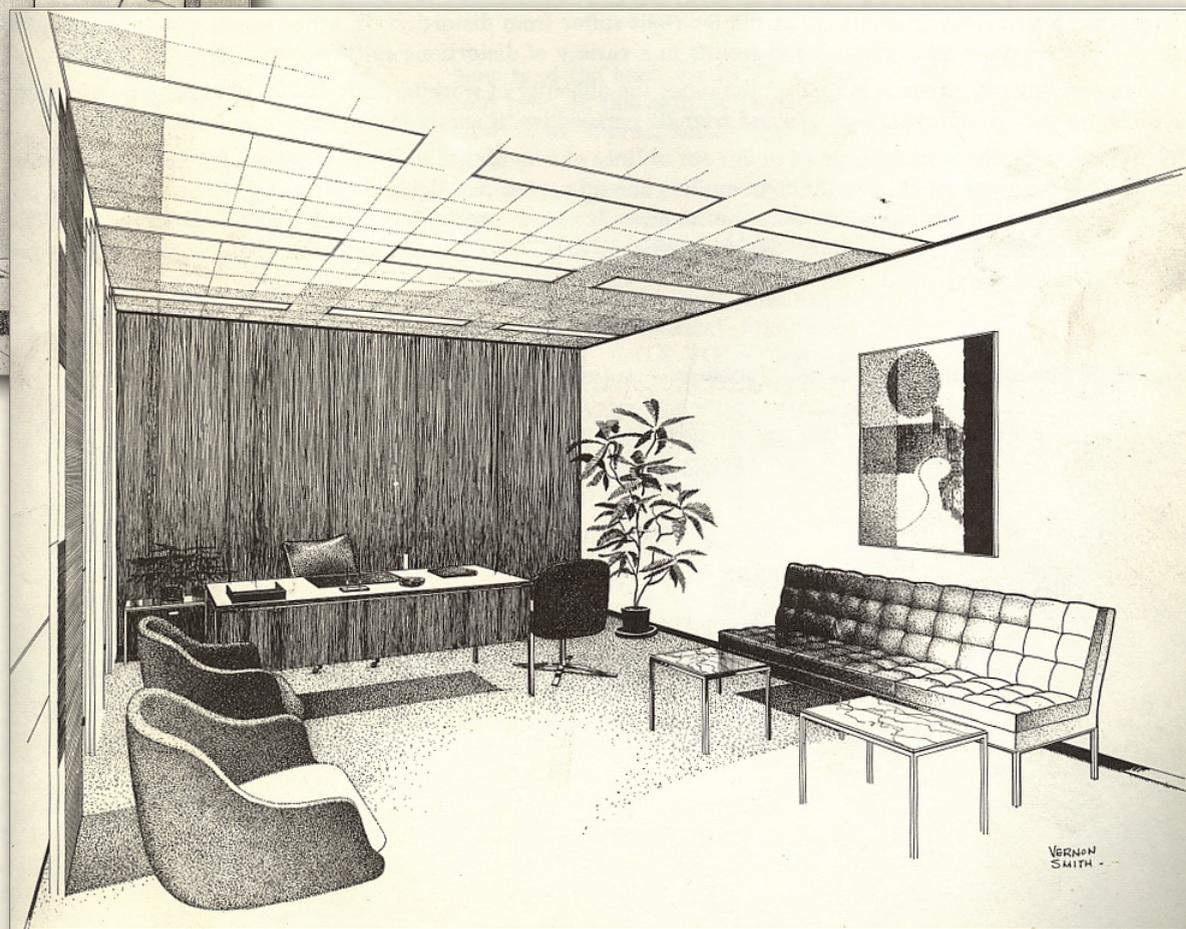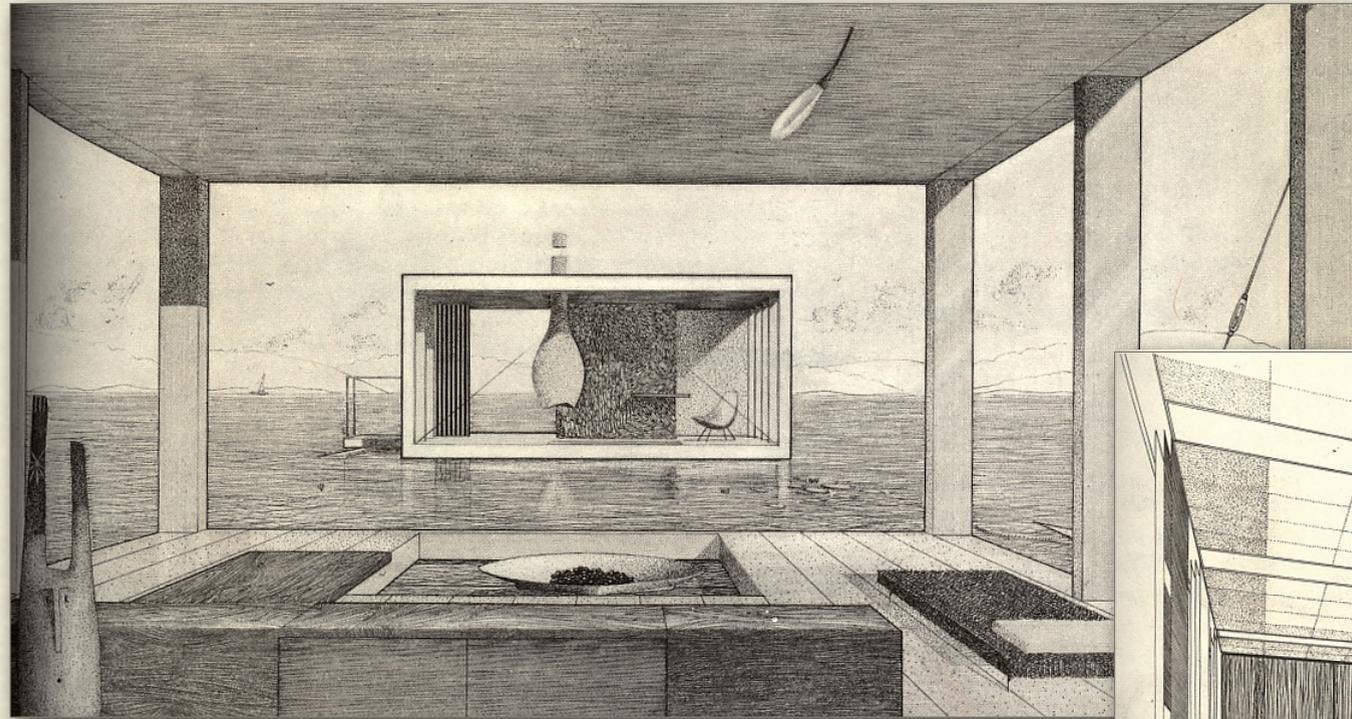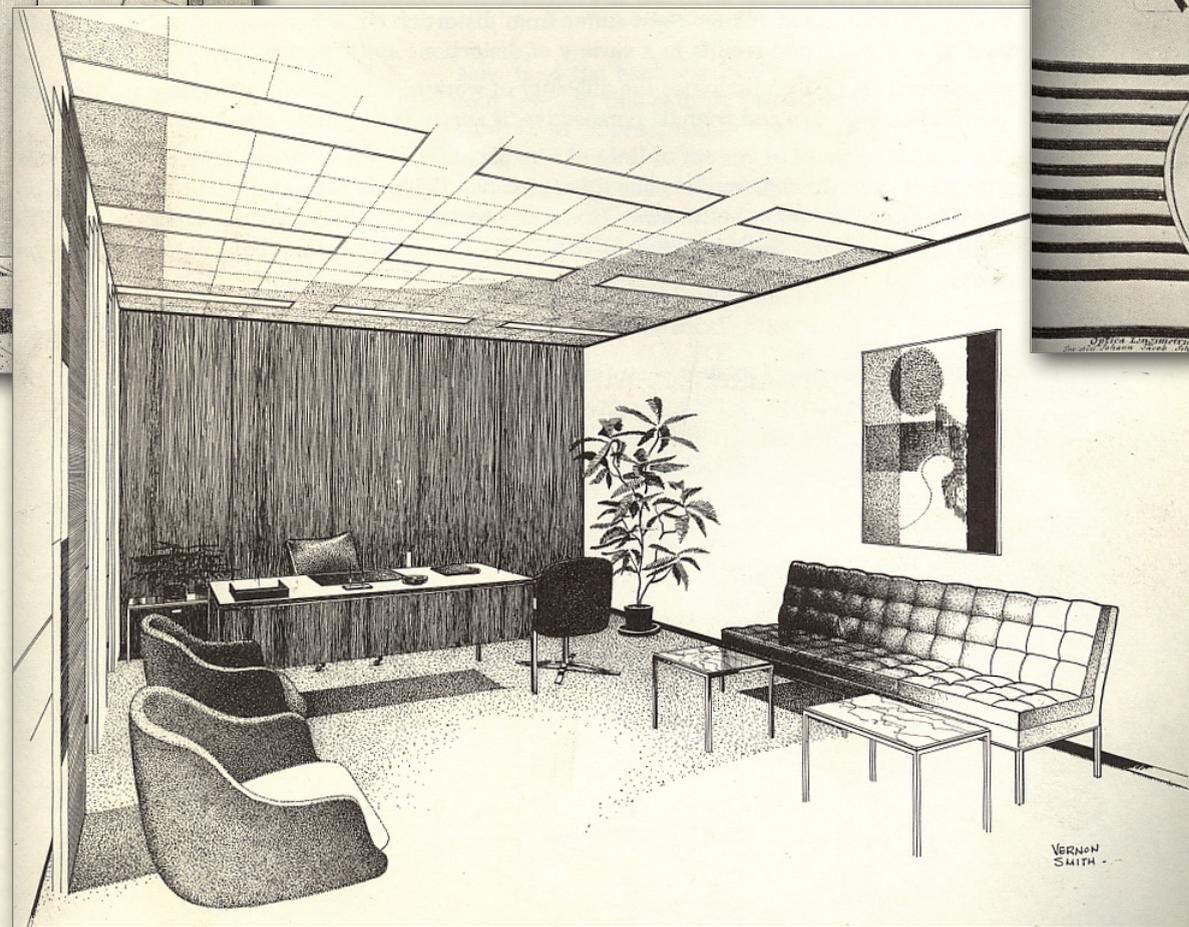1-point

Vanishing points
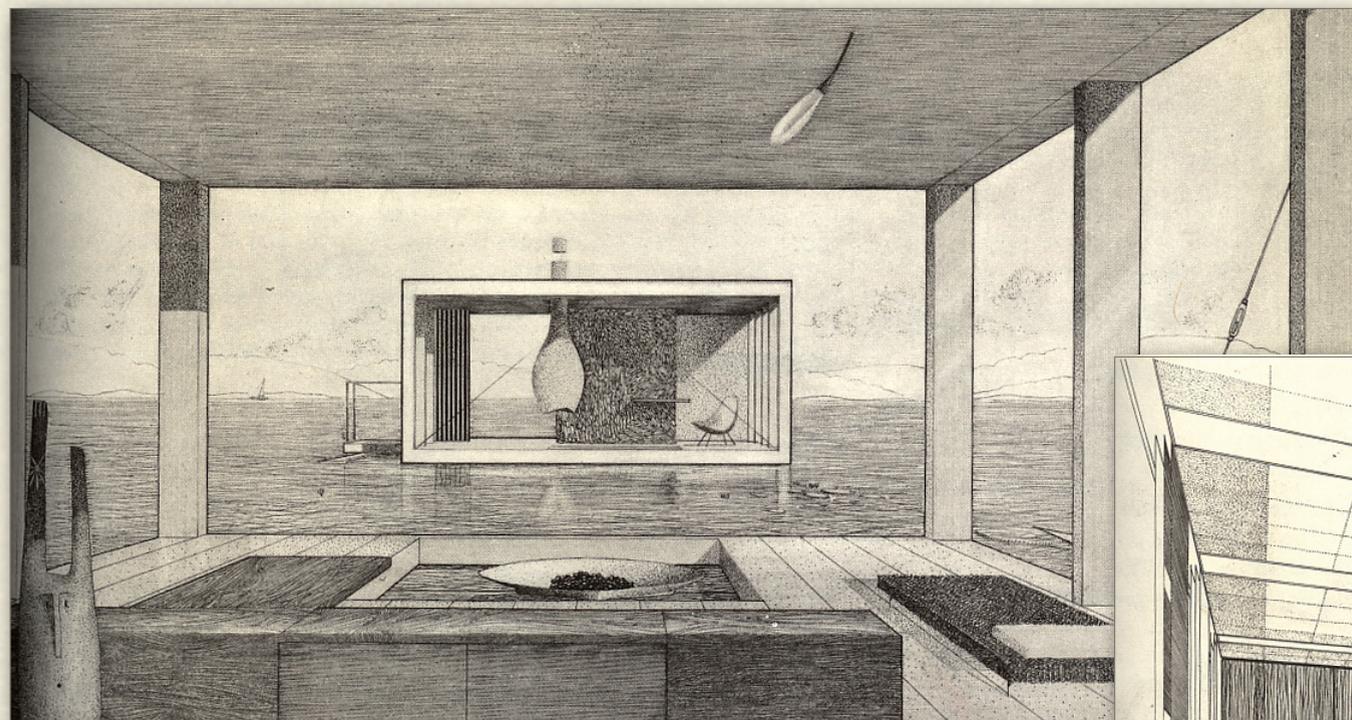
1-point

2-point

Vanishing points

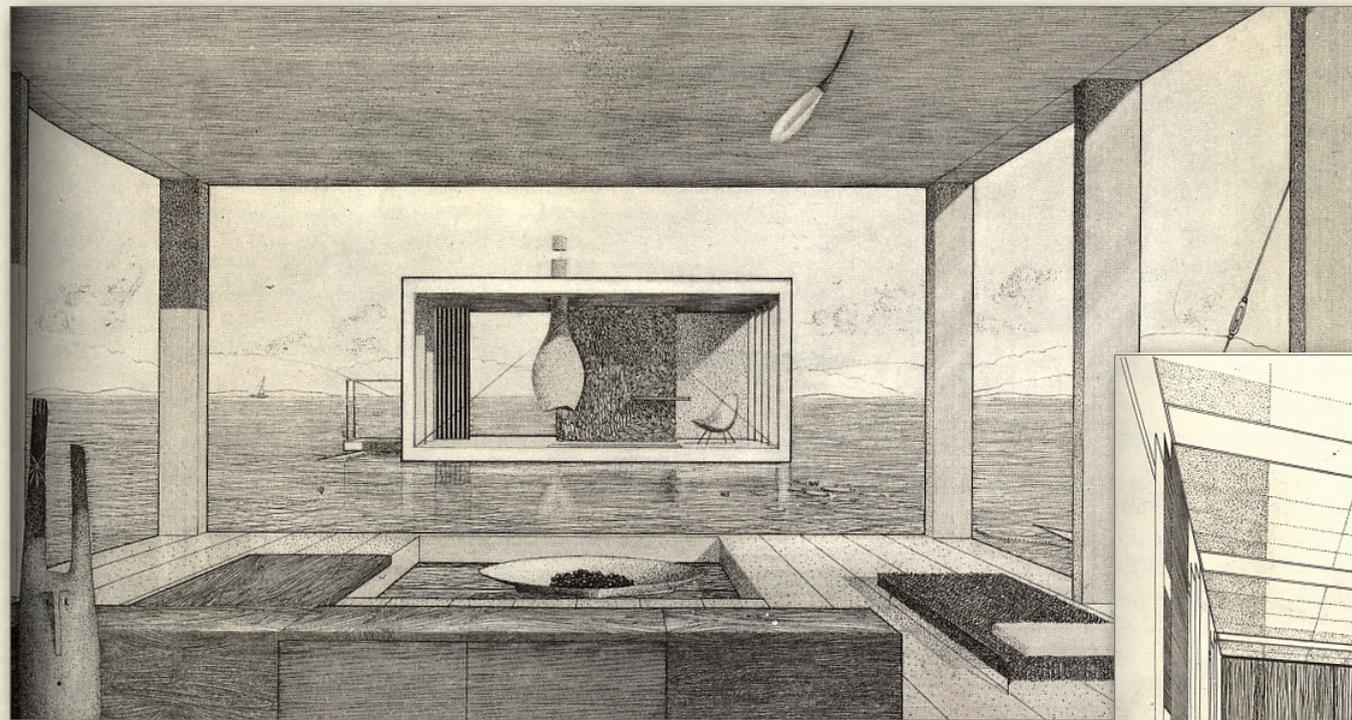(drawings by J. D'Amelio)

1-point

2-point

3-point

Vanishing points

(drawings by J. D'Amelio)

1-point

2-point

3-point

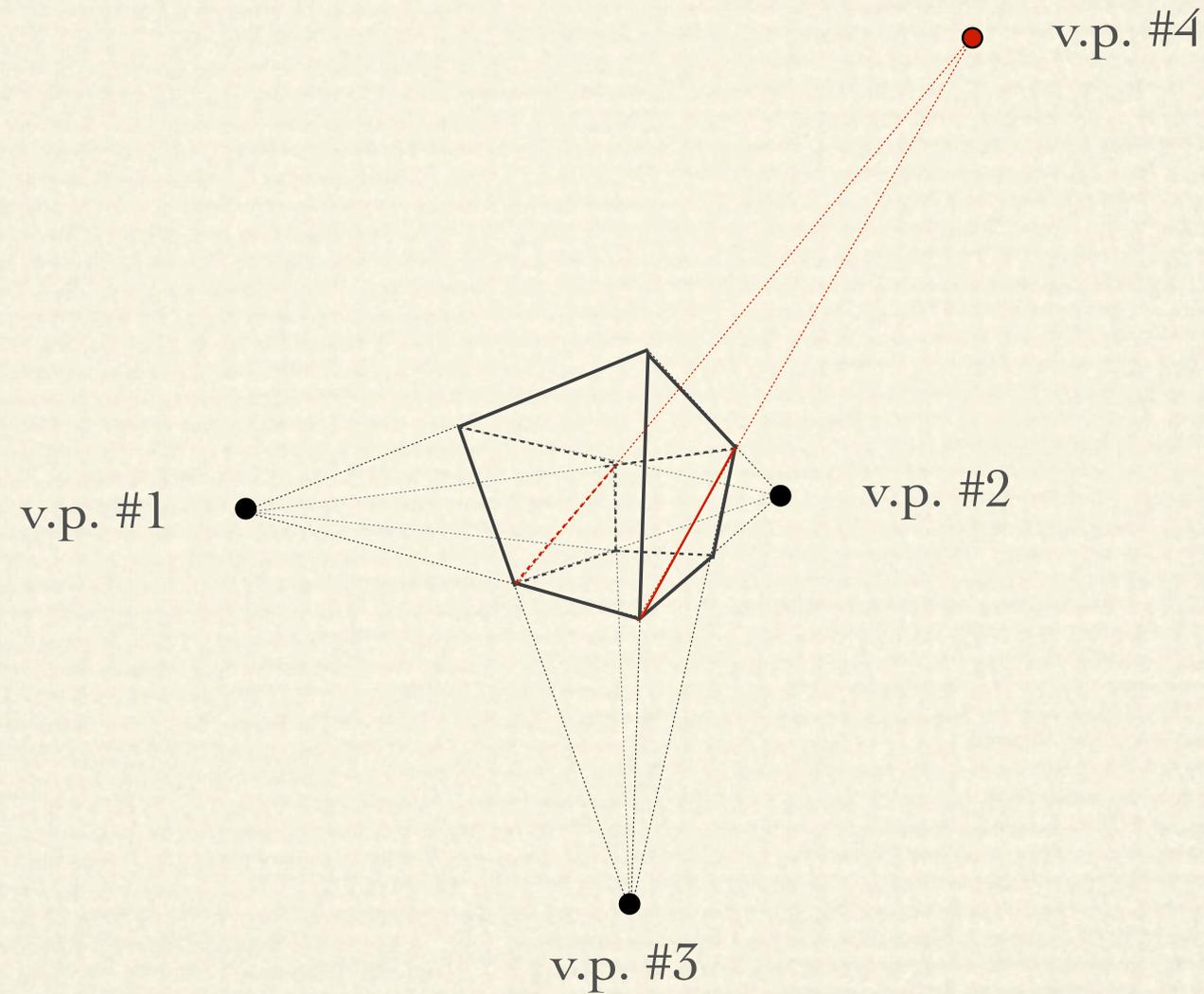Q. How many vanishing points can there be in a perspective drawing?
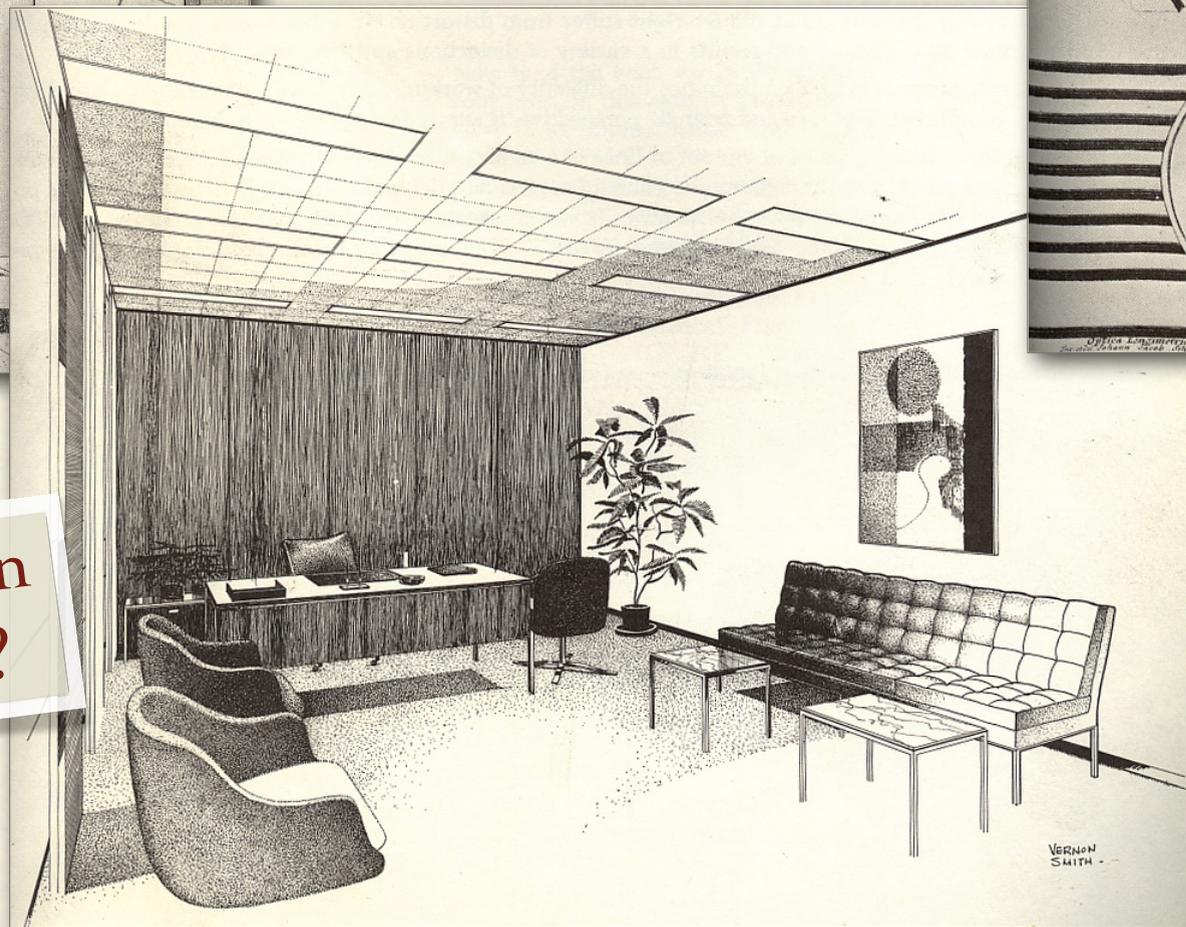
Example of a 4th vanishing point

v.p. #4

v.p. #1

v.p. #2

v.p. #3

❖ each direction of parallel lines converges to a unique vanishing point

Q. Should the distant ends of a long facade be drawn smaller than its center in a perspective drawing?
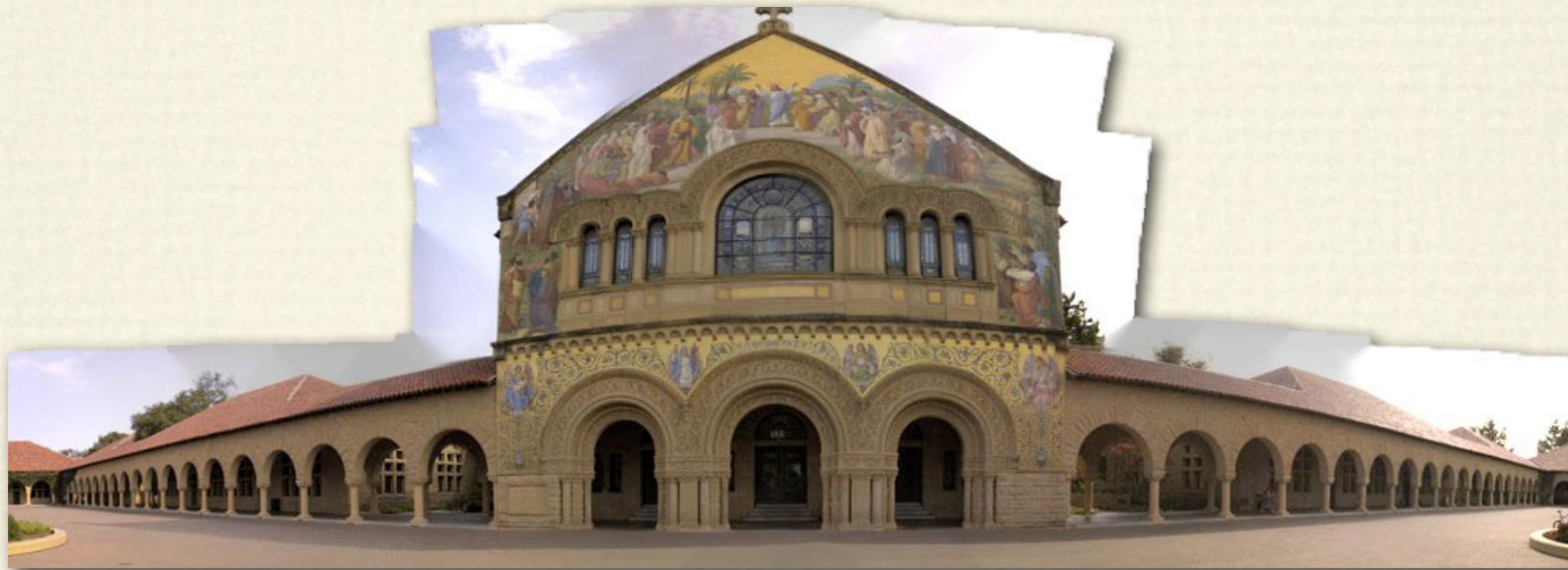
Q. Should the distant ends of a long facade be drawn smaller than its center in a perspective drawing?
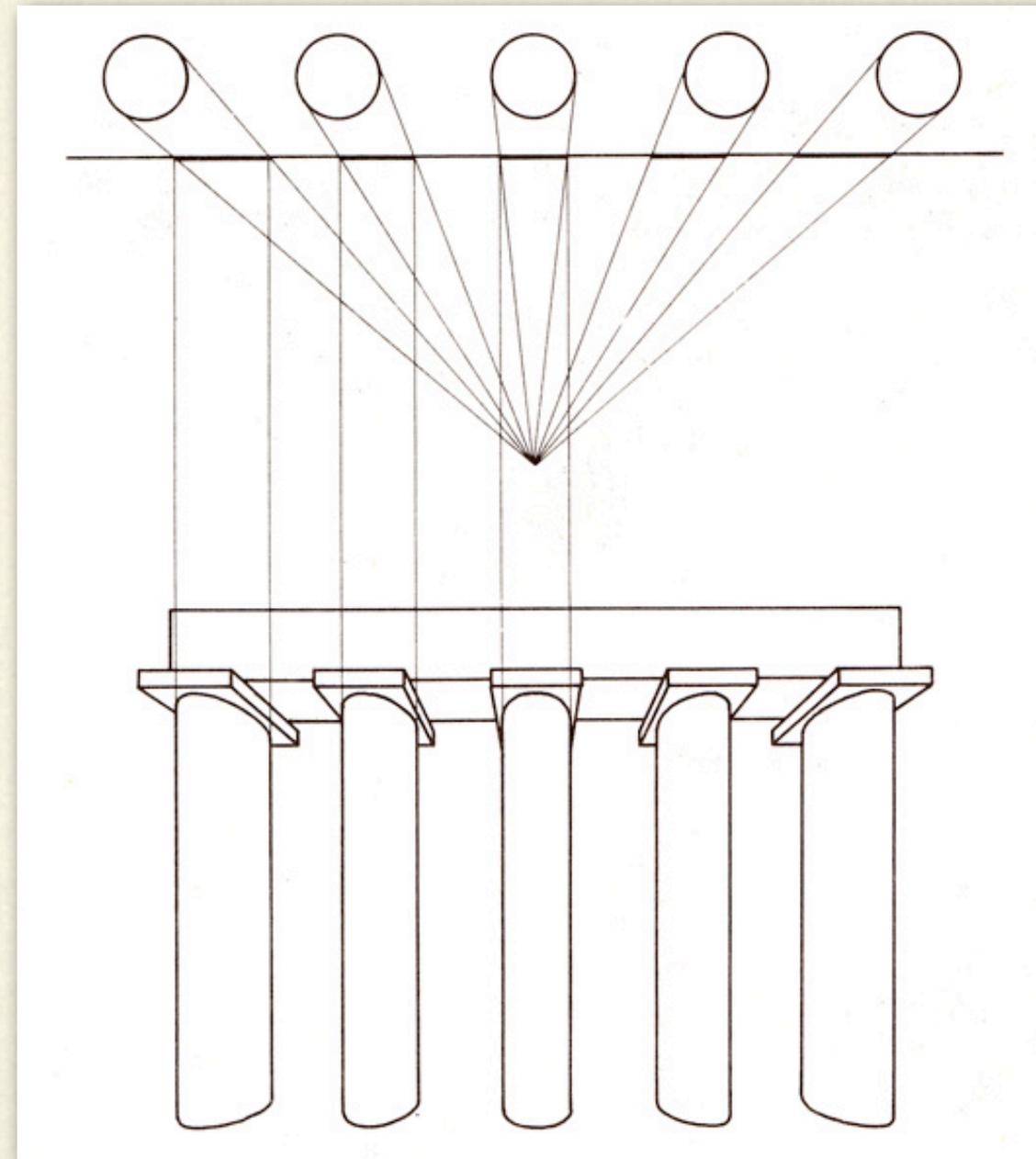

?

Q. Should the distant ends of a long facade be drawn smaller than its center in a perspective drawing?

?

- ❖ no, in linear perspectives straight lines remain straight

- ❖ lines parallel to the picture plane do not converge

- ❖ they appear smaller when you view the drawing,
  due to natural perspective (angles subtended at eye)

Q. Why does this perspective drawing look distorted?

(drawing from Dubery)