

*The Art and Science of Depiction*  
**Drawing systems**

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Drawing systems

**Assignments for Monday 30.**

- Solso *Cognition and the Visual Arts*
  - Chapter 8 & 9
- Final project
  - Firm subject

Drawing systems

**Plan**

- Drawing and projection
  - Linear perspective & the Renaissance
  - Drawing systems
    - Catalogue of “all” drawing systems
    - Advantage/disadvantages
  - Distortion and constraints
- Denotation
- Tone & color

Drawing systems

**Issues**

- Place of the spectator
- Intrinsic/extrinsic (essential/accidental)
- Unified space
- Shape representation
- Error/distortion/choice
  
- Child development
- No cultural judgment!

Drawing systems

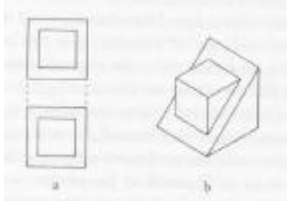
**Context**

- Importance of the notion of front/top/side
- Presence of lines and planes or not
- Orthogonals
  - Lines orthogonal to the picture plane
  - I.e. lines that converge in the center of the image in central perspective
- Picture plane/curved picture

Drawing systems

## Efficient shape representation

- True shape
- 3D layout
- Canonical view
- General/accidental view



Drawing systems

7

## Generic vs. accidental viewpoint



Drawing systems

8

## Generic vs. accidental viewpoint

- Accidental alignment of trash and sea



Photo Peter Turner

Drawing systems

Snapshot-Perspective-Speed, aperture-Filters-Lighting-Processing & Print-Make up-Retouching

9

## Generic vs. accidental viewpoint

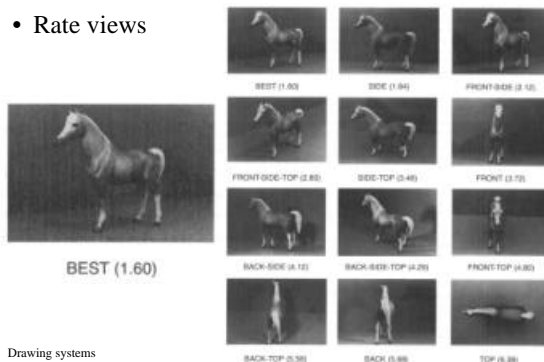


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10

## Canonical view

- Rate views



Drawing systems

## Canonical view

- Rate views
- Features must be salient
- General view
- Front view
- 3/4 up view



Drawing systems

### *Invariants*

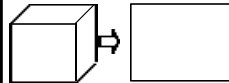
- Invariants
  - Alignments
  - Angles
  - Shape
  - Symmetry
- Property mapping
- Each system here assumes a unified space. Can be mixed up though

Drawing systems

13

### *3D and 2D attributes*

- Show a dice to children (~6-7)
- They usually draw a rectangle
- The rectangle can stand for one face

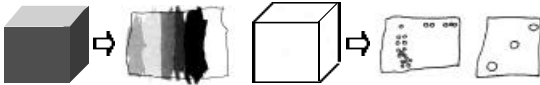


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14

### *3D and 2D attributes*

- Show colored or numbered dice to children (6-7)
- The still draw a rectangle
- But different colors or many points

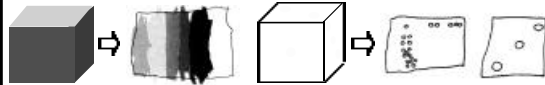


Drawing systems

15

### *3D and 2D attributes*

- Show colored or numbered dice to children (6-7)
- The still draw a rectangle
- But different colors or many points
- The rectangle stands for the whole dice
- The notion of 3D object with corners is translated as a 2D object with corners

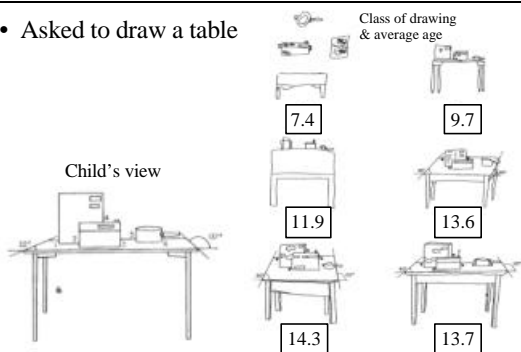


Drawing systems

16

### *Evolution of children's drawings*

- Asked to draw a table

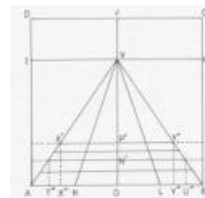


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17

### *Primary/secondary geometry*

- Primary geometry
  - Description in 3D object-space
- Secondary geometry
  - Description in 2D image-space



Drawing systems

18

## Primary/secondary geometry

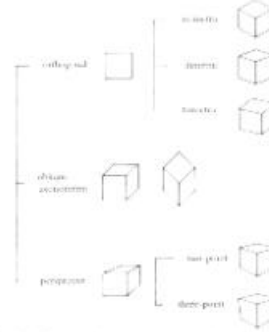
- Primary geometry
  - Description in 3D object-space
- Secondary geometry
  - Description in 2D image-space
  - Permits the description of more drawing systems
  - Often better corresponds to the drawing approach

Drawing systems

19

## British standard classification

- Primary geometry

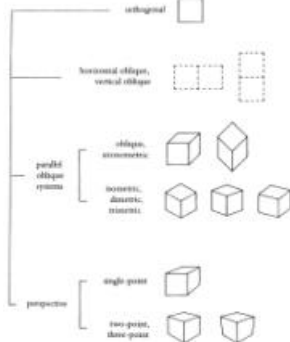


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20

## Willats's classification

- Secondary geometry



Drawing systems

21

## Classification of drawing systems

- Linear
  - Parallel
  - Linear perspective
  - Divergent perspective
- Non Linear
  - Quasi linear
  - Curved projections
  - Topological
  - Split views, fold-out
  - Multiple viewpoints

Drawing systems

22

## Classification of drawing systems

- |   |   |
|---|---|
| <ul style="list-style-type: none"> <li>• Linear                             <ul style="list-style-type: none"> <li>– Parallel                                     <ul style="list-style-type: none"> <li>• Orthogonal</li> <li>• Fold-out oblique   <ul style="list-style-type: none"> <li>– Horizontal oblique</li> <li>– Vertical oblique</li> </ul> </li> <li>• Orthographic   <ul style="list-style-type: none"> <li>– Isometric</li> <li>– Others</li> </ul> </li> <li>• Non orthogonal   <ul style="list-style-type: none"> <li>– Oblique</li> <li>– Axonometric</li> </ul> </li> </ul> </li> <li>– Linear perspective                                     <ul style="list-style-type: none"> <li>• One point</li> <li>• Two points</li> <li>• Three points</li> </ul> </li> <li>– Divergent perspective</li> </ul> </li> </ul> | <ul style="list-style-type: none"> <li>• Non Linear                             <ul style="list-style-type: none"> <li>– Quasi linear                                     <ul style="list-style-type: none"> <li>• Naive perspective</li> <li>• Expressionist perspective</li> <li>• Importance-driven</li> <li>• Cell panorama</li> </ul> </li> <li>– Curved projections                                     <ul style="list-style-type: none"> <li>• Panorama</li> <li>• Fish-eye</li> </ul> </li> <li>– Topological</li> <li>– Split views, fold-out</li> <li>– Multiple viewpoints</li> </ul> </li> </ul> |
|---|---|

Drawing systems

23

## Linear projections

- Straight lines and alignments are preserved
- Can be expressed in primary geometry
  - Ray-image intersections
  - A matrix
- Parallel
- Linear perspective
- Divergent perspective

Drawing systems

24

## Parallel projections

- No foreshortening
- Can represent true shape
- Some are poor shape representations
- Projection direction
  - Orthogonal to image plane or not
  - Along one principal direction or not
- “Stretching” or not

Drawing systems

25

## Parallel projections

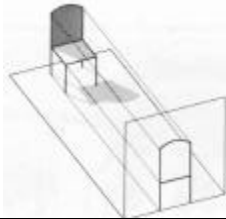
- Orthogonal
- Fold-out oblique
  - Horizontal oblique
  - Vertical oblique
- Non orthogonal
  - Oblique
  - Axonometric
- Orthographic
  - Isometric
  - Others

Drawing systems

26

## Orthogonal

- Direction
  - Perpendicular to image plane
  - Along one principal direction
- True shape for objects parallel to image plane

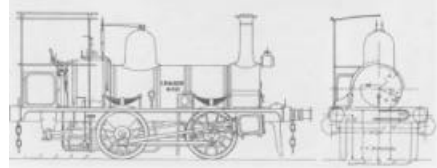


Drawing systems

27

## Orthogonal

- Direction
  - Perpendicular to image plane
  - Along one principal direction
- True shape for objects parallel to image plane
- Typically engineering



Drawing systems

28

## Orthogonal

- Amphora, 6<sup>th</sup> century BC



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29

## Orthogonal

- Bayeux Tapestry 1080



Drawing systems

30

### Orthogonal

- Telephoto

*As the hijack bargaining goes on under the sweltering sun...*

Drawing systems 31

### Orthogonal

- Child drawing

Drawing systems 32

### Parallel projections

- Orthogonal
- Fold-out oblique
  - Horizontal oblique
  - Vertical oblique
- Non orthogonal
  - Oblique
  - Axonometric
- Orthographic
  - Isometric
  - Others

Drawing systems 33

### Fold-out oblique

- Horizontal oblique
- Vertical oblique
- Direction
  - 45°, parallel to one principal face (top or side)

Drawing systems 34

### Fold-out oblique

- Horizontal oblique
- Vertical oblique
- Direction
  - 45°, parallel to one principal face (top or side)
- Can be stretched for fold-out
  - True shape for 2 directions
- Mainly interesting for secondary geometry

Drawing systems 35

### Horizontal oblique

- Folk art

Fig. 2.8. Paul A. Siefert, *Residence of Ab. E. H. Jones*, 1981. Watercolor, 34.6 x 69.9 cm. New York State Historical Association, Cooperstown, New York.

Drawing systems 36

### *Horizontal oblique*

- Icons



Drawing systems

37

### *Horizontal oblique*

- Child drawing



Drawing systems

38

### *Horizontal oblique*

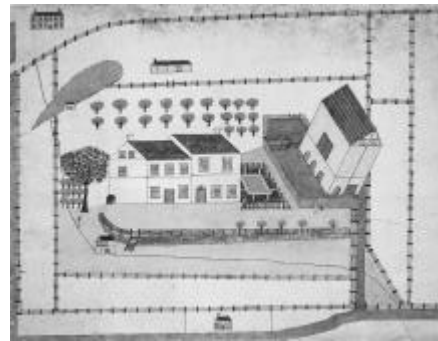
- Cézanne Still life with a commode, 1887



Drawing systems

39

### *Pushing the envelope*



Drawing systems

40

### *Vertical oblique*

- Soriguerola, 13<sup>th</sup>

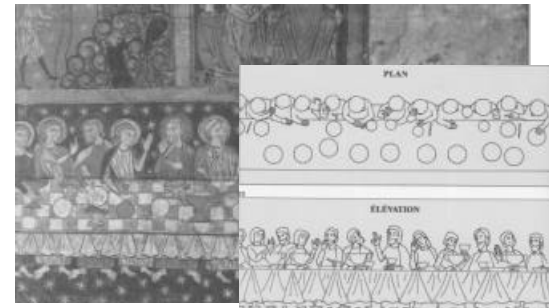


Drawing systems

41

### *Vertical oblique*

- Soriguerola, 13<sup>th</sup>



Drawing systems

*Vertical oblique*

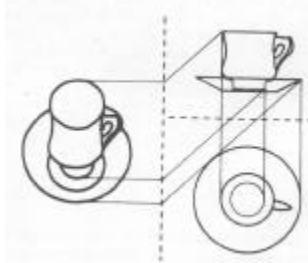
- Juan Gris, *Breakfast*, 1914



Drawing systems

43

*Vertical oblique*



Drawing systems

44



*Vertical oblique*

- Indian art, 1660



Drawing systems

45

*Vertical oblique*

- Claude Rogers, *The Hornby Train*, 1951-53



Drawing systems

46

*Vertical oblique*

- Andre Kerstes, *Tulipe Melancolique*



Drawing systems

47

*Pushing the envelope*




Drawing systems

48



### *Pushing the envelope*

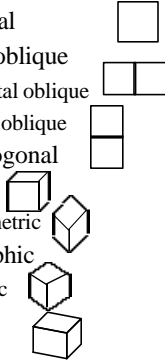
- Non-linear
- Locally linear



Drawing systems 49

### *Parallel projections*

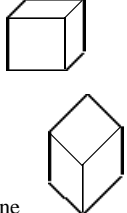
- Orthogonal
- Fold-out oblique
  - Horizontal oblique
  - Vertical oblique
- Non orthogonal
  - Oblique
  - Axonometric
- Orthographic
  - Isometric
  - Others



Drawing systems 50

### *Non orthogonal*

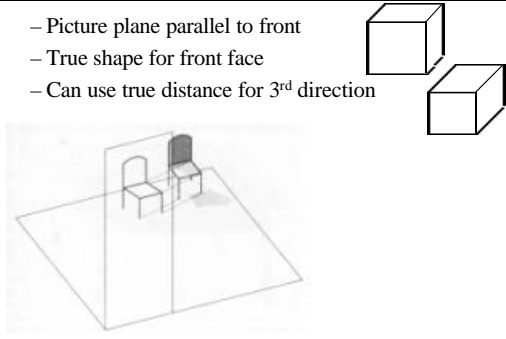
- Direction
  - non orthogonal to picture plane
- Oblique
  - Picture plane parallel to front
  - True shape for front face
- Axonometric
  - True shape for top face
  - True distance for up direction
  - Direction 45° of the picture plane



Drawing systems 51

### *Oblique*


- Picture plane parallel to front
- True shape for front face
- Can use true distance for 3<sup>rd</sup> direction



Drawing systems 52

### *Oblique*


- Henry Lapp, 19<sup>th</sup> century



Drawing systems 53

### *Oblique*

- Lady Wenji's Return to China, 12<sup>th</sup> century



Drawing systems 54

## Oblique



Drawing systems

55

## Oblique

- *Phoenix and Achilles*, 350-340 BC



Drawing systems

56

## Axonometric

- Axonometric
  - True shape for top face
  - True distance for up direction
  - Direction 45° of the picture plane

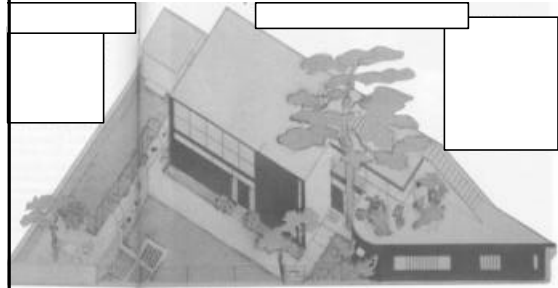


Drawing systems

57

## Axonometric

- Le Corbusier was a big fan

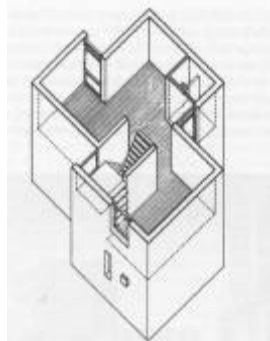


Drawing systems

58

## Axonometric

- James Stirling, 1953



Drawing systems

59

## Axonometric








- Juan Gris, *Breakfast*, 1914



Drawing systems

60



## Parallel projections

- Orthogonal 
- Fold-out oblique
  - Horizontal oblique 
  - Vertical oblique 
- Non orthogonal
  - Oblique 
  - Axonometric 
- Orthographic
  - Isometric 
  - Others 

Drawing systems

61

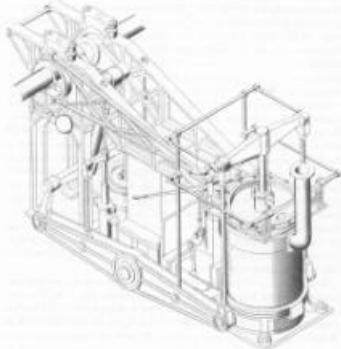
## Orthographic

- Direction
  - Orthogonal to picture plane
  - Along no principal direction
- Isometric 
  - Direction along the average of the principal directions
  - True distances along 3 directions
- Others 
  - Generic orthographic

Drawing systems

62

## Isometric

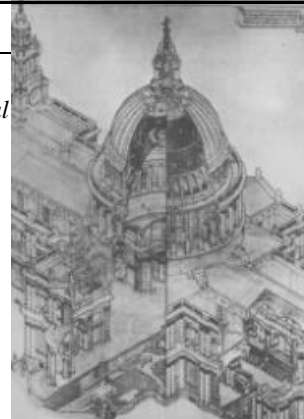


Drawing systems

63

## Isometric

- Brooks-Greaves  
*St Paul's Cathedral*  
1928

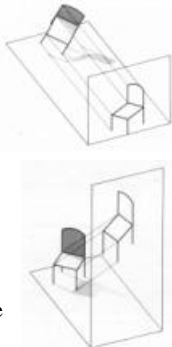


Drawing systems

64

## Isometric vs. Axonometric

- Isometric
  - No true shape
  - True distances in 3 directions
  - Little distortion
  - Direction average 2 principal directions
- Axonometric
  - True shape for top face
  - True distance for up direction
  - Direction 45° from picture plane



Drawing systems

65

## General Orthographic

- Seldom used!

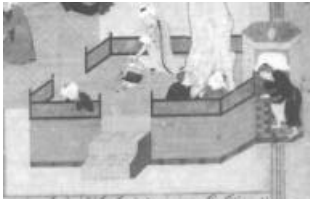


Drawing systems

66

### *Mixed parallel system*

- Persian miniature, 1494
- Oblique+vertical oblique



Drawing systems

67

### *Classification of drawing systems*

- Linear
  - Parallel
  - Linear perspective
  - Divergent perspective
- Non Linear
  - Quasi linear
  - Curved projections
  - Topological
  - Split views, fold-out
  - Multiple viewpoints

Drawing systems

68

### *Linear perspective*

- Foreshortening
- The spectator is “immersed”
- Potential distortions
  
- One point
- Two points
- Three points

Drawing systems

69

### *1-point perspective*

- Central focus
- Preserves horizontals and verticals



Drawing systems

70

### *1-point perspective*

- Central focus
- Preserves horizontals and verticals
- Can mean that the optical center is not the center of the image
  - View-camera

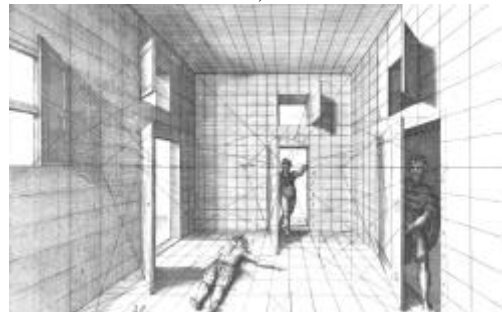


Drawing systems

71

### *1-point perspective*

- Jean Vredeman de Vries, 1604



Drawing systems

72

### *1-point perspective*

- Unknown artist Ideal city, 15th



Drawing systems

73

### *1-point*

- Interior of St Bavo's church at Haarlem, Pieter Jansz Saenredam, 1648



Drawing systems

### *1-point perspective*

The Avenue Middelharnis, Meindert Obbema 1689



Drawing systems

75

### *1-point perspective*

Western perspective in a Japanese picture



Drawing systems

76

### *2-point perspective*

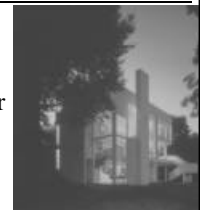


Drawing systems

77

### *2-point perspective*

- Objects stand out of the picture
- Preserves verticals
- Can mean that the optical center is not the center of the image
  - Architecture lens



Drawing systems

78

*Old assignment*

- Before: 3-point perspective



Drawing systems

79

*Old assignment*

- A



Drawing systems

80

*3-point perspective*



Drawing systems

81

*3-point perspective*

- Dramatic 3D effect
- The generic case, nothing preserved
- seldom used through art history



Drawing systems

82

*Perspective anomaly and expression*

- Giorgio de Chirico, *Mystery and Melancholy of a Street*, 1914



Drawing systems

83

*Perspective anomaly and expression*

- Giorgio de Chirico *Les Muses Inquietantes* 1925

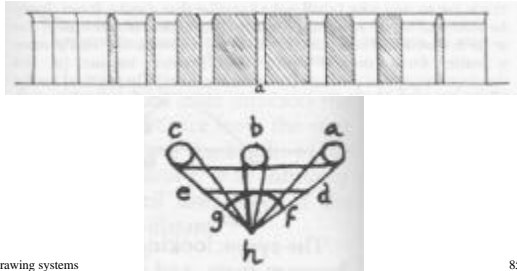


Drawing systems

84

### *Perspective distortion*

- Wide angle projection
- Does not preserve subjective size



Drawing systems

85

### *Perspective distortion*

- Wide angle projection
- Does not preserve subjective size



Drawing systems

86

### *Perspective distortion*

- Wide angle projection
- Distorts shape



Drawing systems

87

### *Perspective distortion*

- Portrait: distortion with wide angle



Wide angle

Standard

Telephoto

Drawing systems

88

### *Perspective distortion*

- The sphere is projected as an ellipse
- Symmetry is not preserved
- Some perspective manuals claim that the projection of a sphere is a circle



Drawing systems

89

### *Perspective distortion*

- The sphere should be projected as an ellipse
- But a circle is used



Drawing systems

90

### *Classification of drawing systems*

- Linear
  - Parallel
  - Linear perspective
  - Divergent perspective
- Non Linear
  - Quasi linear
  - Curved projections
  - Topological
  - Split views, fold-out
  - Multiple viewpoints

Drawing systems

91

### *Divergent perspective*

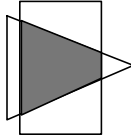
- A.k.a. inverted perspective
- Subject of quarrel, hard to include in a theory
- Icons
- Asian
- Cubism
- Children

Drawing systems

92

### *Divergent perspective: explanations*

- Does not exist!
- Lack of skill
- Represents more faces
- Fear of idolatry
- Perceptual over-compensation
- Perceptual effect of field of view and size constancy



Drawing systems

93

### *Divergent perspective*

- *The Four Gospels, Luke, 1380, Byzantine*



Drawing systems

94

### *Divergent perspective*

- *Mark, 15<sup>th</sup> century, Byzantine*



Drawing systems

95

### *Divergent perspective*

- *Andrei Rublev, The Holy Trinity, 1408~1425*



Drawing systems

95



*Divergent perspective*

- Hasadera Enji (Japanese)



Drawing systems

97

*Divergent perspective*

- Georges Braque, *Still Life: The Table*, 1928



Drawing systems

98

*Divergent perspective*

- David Hockney, *Chair*

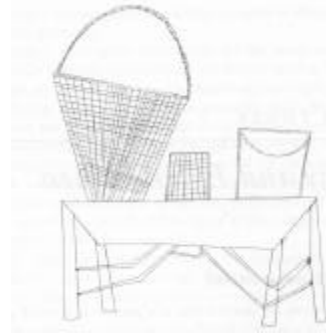


Drawing systems

99

*Divergent perspective*

- Child drawing (Kenyan here)

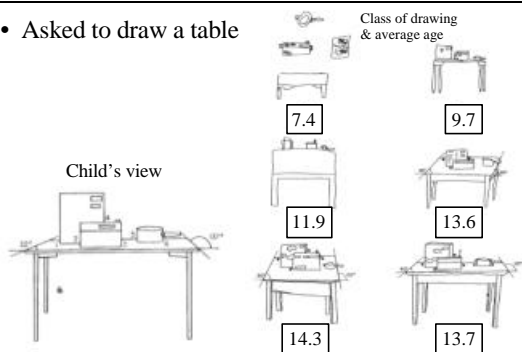


Drawing systems

100

*Evolution of children's drawings*

- Asked to draw a table



Drawing systems

101