Color and Tone System

Calvin and Hobbes

Click

Uh oh...

The sky is a deep orange! Calvin's skin is a pale green! Yellow flowers are now blue!

Every color is the opposite of what it should be!

Calvin has been transferred to a color film negative!

His only hope is to be processed by a 1-hour photo finisher! Developer! I need developer!

Doggone it, Calvin! That's another picture ruined! Can't you look pleasant for 1/500th of a second?
Representation systems

- Drawing and projection
- Denotation
- Tone & color
Tone & color system

- (Often a mix)
- Extrinsic
- Intrinsic
- Symbolic
Extrinsic color

- Renzo Piano
  Tjibaou cultural center
  1991-98
Extrinsic black and white

- Gordon Park, *Red Jackson*  
  *Gang Leader*
Optical intrinsic

- Boticelli *Primavera* 1482
Pure intrinsic colors

- Jawlensky
  *Girl with Peonies*
- *symbolic* + harmony
Why a separate system?

- Willats discusses it only/mainly for the optical denotation system
- But historically it is the major issue with drawing
- It is clearly a different problem from that of dimension and denotation
- Relevant as well for other denotation systems
Denotation system and tone & color

- Silhouette: color of the regions
- Line drawing
  - Line color
  - Line thickness
- Optical
  - Point color & tone
  - Texture
- More an “attribute system” than just tone & color
Denotation system and tone & color

Tone & color system
Denotation system and tone & color
Denotation system and tone & color

- Braque Un Poeme Dans Chaque Livre
Denotation system and tone & color
Denotation system and tone & color

- Amedeo Modigliani
  *Tete et buste de profil avec boucle d'oreille*
  1912
Picture color dimensions

- **Tone**
- **Hue**
- **Saturation**
- **Simultaneous contrast**
- **Texture**
Beyond color

- Material properties
- Painting
- Gold
- Etc.
Color origin

• Physical extrinsic
• Physical intrinsic
• Symbolic/importance
• Color harmony
• Limitation compensation (or accentuation)
Color and symbol
Issues

- 2D/3D
  - 2D color composition
  - Color linked to the 3D scene
- Per mark/per primitive
  - Is the color constant on a mark?
  - Is it constant on a primitive?
  - Does it vary in the mark
Example

- Paul Klee
  *Hoffmanneske Szene*
  1921
Example
Palette and medium

- Different media permit different ranges of colors
  - E.g. pastels, pencil, watercolor, b/w photo
- The medium can be chosen for the palette
Color and aging
Restoration

- Michelangelo The Creation of Adam 1508-1512
Church and color

Tone & color system
Church and color
Light in the scene

- Intrinsic reflectance
- Different light sources
- Outgoing light
- Shadows
  - Self shadows
  - Cast shadows
- Shading
- Inter-reflection
- Atmospheric perspective
Constancy and scene analysis

• Segmentation into layers
  – Illumination
  – Reflectance
  – Transparency
Light

- Point light source
- Directional light source (sun)
- Extended light source
- Hemispherical light source (sky)
- Ambient light
- Global illumination
Light

- Fall-off
- Attenuation
Light in CG
Plan

• Intro
• Shading
• Shadows
• Atmospheric perspective
• Light transfers
• Photography
Light and shape depiction

- Shading
- Highlight
- Shadow
- Inter-reflection
Shading & BRDF

- Bi-Directional Reflectance distribution function
- Ratio of light arriving from one direction bouncing in another direction
- 4D function (2*2 angles)
Shading & BRDF

- 2 main components
  - Diffuse (omni-directional)
  - Specular (directional): highlight
Shading & BRDF

• Diffuse
  – Depends on angle between light and normal
Shading & BRDF

Tone & color system
Shading & BRDF

Tone & color system
Chiaroscuro

Tone & color system
Saturation shading

- Andreas Mantegna, *Madonna and Child with St John the Baptist and Mary Magdalene*, 1495
Saturation shading

- Andreas Mantegna, *Madonna and Child with St John the Baptist and Mary Magdalene*, 1495
Shading and make up

Tone & color system

Snapshot-Perspective-Speed, aperture-Filter-Lighting-Processing & Print-Make up-Rетouching
Shading and corrective lighting
Lighting and shading

• Alfred Krupp photographed in 1963 by Arnold Newman
• Because Krupp had benefited from the nazis
• Un-friendly lighting
Plan

• Intro
• Shading
• Shadows
• Atmospheric perspective
• Light transfers
• Photography
Shadow

Plate 18
David Allan,
The Origin of Painting
(The Maid of Corinth),
1775. Oil on wood,
38.7 x 31 cm. Edinburgh,
National Gallery of Scotland.
Shadow

- Self, cast and attached shadows
  - (or primary and secondary, double shadow, etc.)
- Not local
- Can be distracting
- Have been depicted or not depending on period

- Hard/soft shadow
Self and cast shadow
Soft shadow

Tone & color system
Shadow

• Pozzo

Tone & color system
Shadows

- 18th century
Shadows

- 18\textsuperscript{th} century
- Lambert
Shadow

- Raphael vs. Master of the Mornauer
Shadow

- Campin, *Trinity* 1427-32
Shadow

- Caravaggio The Supper at Emmaus 1601
Shadow

- Guardi 1755
Shadow

Shadow

- Rembrandt
Shadow

- Follower of Rembrandt: A Man seated reading at a table in a lofty room 1631-50
Shadow & Trompe-l’oeil

- Rembrandt
Shadow & Trompe-l’oeil

Plate 37: Unknown Swabian Artist, Portrait of a Woman of the Hofer Family, 1470. Oil on silver fir, 55.7 x 40.8 cm. London, National Gallery.
Shadow reveal shape
Colored shadow
Shadow reveal

Tone & color system
Shadow reveal
Shadow reveal

Plate 52 Grandville, *The Shadows (The French Cabinet)* from *La Caricature*, 1830.
Shadow

- [Waltz 75]
Plan

- Intro
- Shading
- Shadows
- Atmospheric perspective
- Light transfers
- Photography
Atmospheric perspective

- Saturation
- Hue
- Precision
Atmospheric perspective

- Leonardo
Atmospheric perspective

- Titian, *Bacchus*
Atmospheric perspective

- R. Earlom, *Pastoral Scene*, 1774
Plan

• Intro
• Shading
• Shadows
• Atmospheric perspective
• Light transfers
• Photography
Global illumination

- Light inter-reflection
- Each surface is a secondary light source
- Crucial for indoor scenes
Global illumination

Tone & color system
Global illumination
Global illumination

Rendered using the Lightscape Visualization System. Courtesy of Isao Nagaoka and Joe Henke. Copyright (c) 1995 Digital Architecture (New York, NY).
Global illumination
Global illumination
Counter-example: painting with light
Global illumination & production

- Mostly unused
- Because artists want local control
Global illumination & production

Tone & color system
Plan

- Intro
- Shading
- Shadows
- Atmospheric perspective
- Light transfers
- Photography
Three Point Lighting

- **Key light**
  - Main and visible lighting
- **Fill light**
  - Fill-in shadows
- **Back light**
  - Emphasize silhouette
  - Make subject stand out
- **Independent lighting**
Portrait lighting

Main light
Fill-in light
Accent light
Background light
Filter for black and white

Tone & color system

Snapshot-Perspective-Speed, aperture-Filter-Lighting-Processing & Print-Make up-Retouching
Dodging and Burning

- Clearing Winter Storm
Haze filtering

• Haze is bluish
Example

- Edgar Degas
  Ballet Dancer
  in Position
  facing 3/4 front
  1872
Example

- Tom Purvis 1935