7B Image Studies: Visual Experience and the Shape of Meaning in Images

Laurel Beckman
Department of Art

Lecture #5

COLOR THEORY- HOW WE SEE COLOR

Seeing Color, Wavelengths

Subtractive and Additive Color Systems- Pigment and Light, Paint and Emulsion

RYB, CMYK, RGB

Color Theory Attributes:

Primaries, Secondaries, Tertiaries

Complementary Color

Hue, Value (tints and shades), Saturation/Intensity

Simultaneous Contrast, Contrast

Analogous Color, Temperature/Warm/Cool, Subjective Color, Monochrome, Gold

Intro to Color in Print, Photography, Digital (more next week)

video:
BBC Yorkshire, World's Oldest Color Film (Edward Turner, c 1902) Discovered…, 2012
Nature Communications, Photonic Crystals Cause Active Colour Change in Chameleons, 2015,
Sony Bravia ad, 2006
Zhang Yimou , director, Hero, 2002, extended trailer
Blair Neal, Color a Sound, Max/MSP/Jitter, overhead projector, 2010
Engineerguy (youtube), Fiber Optic Cables: How they work, 2011,
https://www.youtube.com/watch?v=0MwMkBET_5I

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1. **How We See Color, Color Theory Basics**
2. Electromagnetic Spectrum
3. Human Eye, the Retina and Color Vision, web images
4. Refraction & reflection
5. Refracted light
6. Reflected light
7. Dog and human color vision
8. Lisa Jevbratt, Zoomorph, mobile app
9. Nature Communications, Photonic Crystals Cause Active Colour Change in Chameleons, 2015, video
10. Human color blind test image
11. Afterimage
12. George Seurat, La Parade, 1887/8, oil 100x150 cm, and detail
13. Eduardo Kac, Transgenic Albino Rabbit (GPF) "Alba", 2000, injected at an embryonic stage with a florescent protein, Alba emits a green glow when placed under an ultraviolet lamp, other florescent animals

14. The 3 Visual Properties of Color- Hue, Saturation, Value

15. Hue

16. Saturation

17. Saturation Sequence

18. Michelangelo, detail of the Sistine Chapel, 1508, fresco, showing restored colored

19. Chris Ware, 1977 cover, Print's Regional Design Annual

20. Connie Samaras, A Left Over Orange, Sahara Hotel, LV, photograph

21. **Tint, Shade, Tone**, examples

22. Value

23. Value sequence and samples

24. Additive & Subtractive Color Models

25. **Color Models have Primary Colors**, Primary colors can not be mixed or formed from other colors

26. Additive & Subtractive primaries

27. **Additive & Subtractive Color**

28. **Additive Color Primaries**

29. Additive color through light

30. RGB devices, cameras, scanner, monitor, phone, digital camera sensor

31. LED flat screen tv

32. Projection environments

33. 2 projections (Pipolotti Rist Paul Chan)

34. Color and Light

35. Lighting examples

36. Polarized light, nanoclusters backlit with, from *On the Surface of Things: Images of the Extraordinary in Science*, Felice Frankel and George Whitesides, 1997 book, polarization

37. Hubble space telescope image showing false color

38. James Turrell, 1980-86, NY PS1 Installation, Meeting (view with daylight & twilight)

39. Claude Monet, Rouen Cathedral series (30 in all), 1892-4

40. **Color in the Digital Environment** (more next week)

41. Digital color spectrum & web safe colors

42. **Color in Photography** (more next week)

43. Film camera, film, darkroom film enlarger

44. Engineerguy (youtube), Fiber Optic Cables: How they work, 2011

45. Subtractive Color – pigment based

46. Subtractive color model primaries (print and paint)

47. Color in Printing

48. Print primaries (CMYK)

49. Print CMYK in 4-color halftones, more next week

50. Subtractive Color – Pigment

51. Subtractive Color – Pigment Paint Primaries

52. Blue pigment use/meaning 1400's

53. 12 Point color wheel

54. Sony Brava ad 2006

55. Piet Mondrian, Composition.., 1921, painting

56. Roy Lichtenstein, In the Car, 1963, oil on canvas
57. Justin Stadel, public art project, Echo park/LA, 2006
58. McDonalds
59. **Subtractive Color – Pigment Paint Secondary Colors**
60. Color Wheel
61. Secondary colors- Orange, Green, Purple
62. Anonymous, Quilt, secondary colors go well together
63. Paul Cezanne, Montagnes, l'Estaque, 1878-80, oil 53x72cm
64. Stenberg Bros., The Man From the Forest, 1928, offset film poster 42x28"
65. Kevin Appel, Untitled Interior #5, 1995, oil 64x58"
66. **Tertiaries, everything else**
67. Color Wheel with more colors
68. **Complementary Colors**
69. Color wheel
70. Complementary Colors, blue/orange, purple/yellow, red/green, colors between
71. Mark Rothko, oil on canvas, c. 1950
72. Nikoali Kulbin, Sea View, 1905, oil 39"x25"
73. Masami Teraoka, Aids Series: Geisha and Fox, 1988, watercolor, 15x25
74. Alex Grey, "Painting", c.1998, oil on linen 40x30"
75. Vincent Van Gogh, The Night Cafe, 1888, 39x92cm
76. Red/green squares (same red), proximity change contrasts/appearance, simultaneous contrast
77. **Color temperature**
78. Color temperature, warm & cool, examples
79. **Monochrome (one hue)**
80. Yan Pei-Ming, Mao au Balcon de Tienanmen, 2000, oil on canvas, 98.5"x98.5"
81. Gary Hume, Belerus, 2000, enamel on aluminum, 100"x135"
82. Yves Klein, R11, 1960, oil and sponges on canvas
83. Mark Tansey, unknown title painting
84. Anna Atkins, from Ocean Flowers, 1843, cyanotype from seaweed
85. Unknown, sepia photograph
86. **Analogous Color**
87. Analogous color wheel parts and examples
88. Lisa Yuskavage, Little Farm, 2012, oil on linen
89. Analogous color in interior design, fabric, product design
90. **Gold**
91. Buoninsegna, 1315, egg tempera on poplar, the isolated figures deny natural space, with the use of gold helping allusion to a spiritual space
92. Budda cave, unknown place, date
93. Bernard Faucon, Le Petite Boudoha, 1998, color photograph
94. Andy Warhol, Lady on a Rooster, 1957, gold foil, water color, ink 25x19"
95. Andy Warhol, Oxidation Painting, 1978, mixed media (urine) on copper paint on canvas 72x204"
96. Jim Hodges, and still this, 2008, real gold leaf with Beva on gessoed linen, 10 parts, 200"x185'x89" ea
97. Gold sucking trees in Australia

98. Florescent and Day Glo- Fluorescence

99. Color tests, the same yellow, red, blue, yellow, blue

100. Color tests, legibility

101. Komar and Melamid, America's Most Wanted Painting, 1994 paintings from survey results

102. Shutterstock's map of the most downloaded colors in 20 countries, 2015

103. Dragon made of jackolanterns, lit

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HOW WE SEE COLOR:

The most technically accurate definition of color is: "Color is the visual effect that is caused by the spectral composition of the light emitted, transmitted, or reflected by objects."

Color results from light rays, which are a kind of electromagnetic energy. Our eyes can see the light of wave lengths between 400-700 millimicrons. The human eye + the brain sees the color, it's a collaboration. Light waves themselves are not colored.

Light enters the eye and hits the retina, where it is absorbed by the rod and cone cells, which in turn transmit signals via the optic nerve directly to the "visual center" at the back of the brain.

White light (the sun) passing throught the prism is dispersed into the colors of the visible spectrum> refraction. Other ways of to generate colors include interference, diffraction, polarization, and florescence. Each spectral hue is the complement of the mixture of all the other spectral hues.

When we look at an object/surface and see, say, red- what is happening is that the object absorbs all the spectral colors besides red and reflects only the red.

There is no such thing as perfect color or pure color. Color perception, theories and use of color are all entirely subjective.

When nature/science's pigments are combined with spectral light millions of shades are produced. Pigments (paint, ink, etc.) are always duller than light.

The experience of color is the result of the eye+brain including culture, light and the eye+"brain" makes the image: examples of engineering a vision

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The two main color models are- Additive and Subtractive Color

Additive Color
Color as the direct product of light; film photography (hybrid), digital photography

Subtractive Color
color is perceived as a result of pigment , this is the family for paint pigments and there is also a sub-set of printing ink pigment within the Subtractive Color Model

Primary Colors: can not be created by mixture, and cannot be broken down into component parts

Subtractive color primaries:
for Print- Cyan, magenta, Yellow, Black (CMYK)
for Paint- Red, Yellow, Blue (RYB)

Additive color primaries:
Red, Green, Blue (RGB)

Secondary Colors: are the result of mixing 2 primaries together

Complementary Color:
Directly opposite on the color wheel, and are of extreme contrast. Red absorbs mostly green, etc. Causes vibration.

Split Complement: is a color and the two colors on either side of its complement; produces less contrast than full complements

Simultaneous Contrast:
When 2 colors come into direct contact, the contrast intensifies the difference between them.

The 3 Visual Properties of Color: HUE, SATURATION, VALUE

Hue:
Common name of a color, determined by its specific wavelength

Saturation also called Intensity or Chroma:
The depth or "colorfullness" of a color, its freedom from gray.
Strenght or purity of a color. The quality of "light" in a color-brightness and dullness.
Adding a neutral gray changes intensity but not value.

Value:
Relative degree of light and dark properties of a color, achieved through adding white=tint or black=shade.

For example, when you add white to a color it becomes lighter in value but lower in intensity. The most efficient way to change intensity is by mixing its complement.

Monochrome: Containing: just one hue

Color temperature: warm/cool colors

Analogous Color:
Closely related Hues -by positon on the spectrum (& color wheel)

Gold -used to describe spiritual space, devotional, fetishistic use of gold

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A SHORT HISTORY OF COLOR THEORIES

1666- Issac Newton discovers that white light going through a prism refracts into the visible spectrum.
1770-Moses Harris observes 3 "primitive" or primary colors, red, yellow and blue. This theory was finally accepted 100 years later.
1810- Johann W. Goethe, who opposed Newtons "optiks", and wrote in "The Doctrine of Colors" that there were only 6 spectral colors, and that color was primarily composed of light and dark. He also observed that yellow sunlight produced violet (its complement) shadows.
1839- M.E. Chevreul, a French chemist, develops his theory of Simultaneous Contrast, which hold s that contrast intensifies the difference. Maximum color contrast achieved by placing certain colors side by sdie. If 2 colors are placed next to each other the difference between them appears at its greatest. But the effect is most striking with complementary colors (the color of the spectrum it bsorbs, i.e., red absorbs mostly green)
1921-1960- Johannes Itten is responsible for our understanding of the 3 "visual dimensions or properties of color"> HUE, VALUE (Tone), AND SATURATION/INTENSITY