

The Art and Science of Depiction

***Limitations of the Medium,
compensation or accentuation:
Contrast & Palette***

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The Ambassadors




Limitations: contrast & palette 2

Makoto Nakamura



Limitations: contrast & palette 3

Makoto Nakamura




Limitations: contrast & palette 4

Makoto Nakamura



Limitations: contrast & palette 5

Makoto Nakamura



Limitations: contrast & palette 6

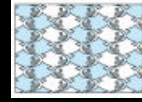
Makoto Nakamura



Limitations: contrast & palette

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Makoto Nakamura



Limitations: contrast & palette

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Makoto Nakamura



Limitations: contrast & palette

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Makoto Nakamura



Limitations: contrast & palette

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Makoto Nakamura



Limitations: contrast & palette

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Makoto Nakamura



Limitations: contrast & palette

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Assignments for Monday 16.

- Solso *Cognition and the Visual Arts*
 - Chapter 5 & 6
- Essay
 - Exploratory or Picture comment
 - Choose subject
 - Outline of the issues

Limitations: contrast & palette

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Personal Meeting II

- Class
- Essay
- Project

Limitations: contrast & palette

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Plan

- The picture is flat
- The viewpoint is unique
- The image is finite, it has a frame
- The picture is static
- The contrast is limited

Limitations: contrast & palette

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Context

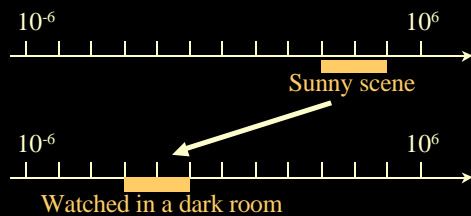
- Real world: 10^{-6} to 10^6 cd/m²
- Picture
 - Max contrast 1:500
 - Typically 1:50

Limitations: contrast & palette

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Two problems

- The image intensity does not match the real conditions

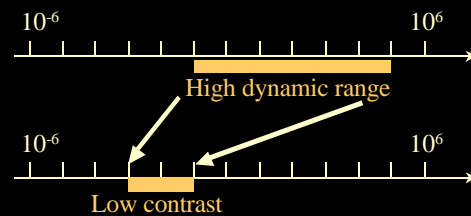


Limitations: contrast & palette

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Two problems

- The image intensity does not match the real conditions
- The contrast is not sufficient



Limitations: contrast & palette

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Three contexts

- Photo
- Computer Graphics
- Painting and drawing

Limitations: contrast & palette

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The limit of illusion

- Pozzo's ceiling: the Sky is not bright enough



Limitations: contrast & palette

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The limit of illusion

- Brunelleschi's experiment
 - Used a mirror for the sky

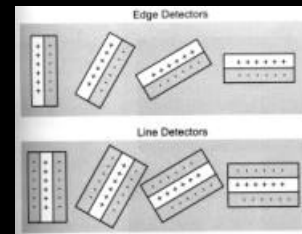


Limitations: contrast & palette

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Edge detection

- Similar to center-surround
- Measured using micro-electrodes

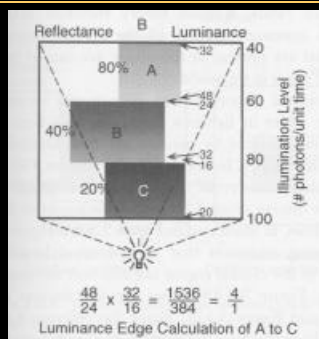


Limitations: contrast & palette

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Land Retinex

- Local contrast



Limitations: contrast & palette

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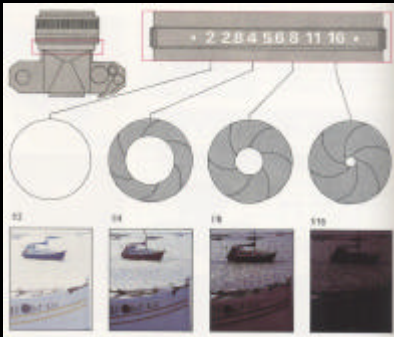
Plan

- Problem 1: intensity does not match
 - Exposure
 - Viewing conditions
 - Night scenes
- Problem 2: insufficient contrast
 - Tone Reproduction
 - Lighting
 - Tone mapping in CG
 - Flares
 - Painting

Limitations: contrast & palette

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Photo exposure

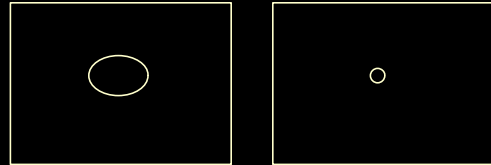


Limitations: contrast & palette

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Metering

- Centered average
- Spot
- Incident
 - Measure incoming light



Limitations: contrast & palette

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Nikon 3D Color Matrix

- Database of 30,000 photos
- Multiple captors (segments)
- Exposure depends on
 - Brightness from each segments
 - Color
 - Contrast
 - Distance
 - Focus (where is the subject)

Limitations: contrast & palette

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Limitations: contrast & palette

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Hunt and Stevens effect

- Stevens effect
 - Contrast increases with luminance

Limitations: contrast & palette

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Hunt and Stevens effect

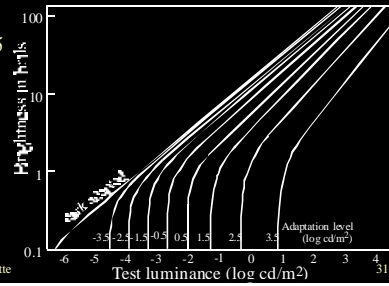
- Stevens effect
 - Contrast increases with luminance
- Bartleson-Breneman effect
 - Image contrast changes with surround
 - A dark surround decreases contrast (make the black of the image look less deep)
- Hunt effect
 - Colorfulness increases with luminance
- Hence the need for gamma correction

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Suprathreshold

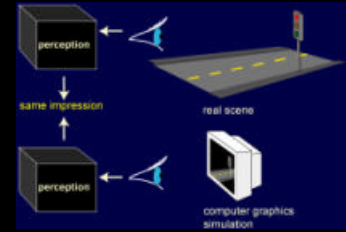
- Subjective brightness
- Power law
- Exponent
 - 0.33 to 0.5
- Gamma correction



Limitations: contrast & palette

Tone mapping

- Real scene: large range of luminance
 - (from 10^{-6} to 10^6 cd/m²)
- Limitation of the display
 - 1-100 cd/m²
- Goal:
 - Reproduce a faithful impression



Limitations: contrast & palette

Perceptual tone mapping

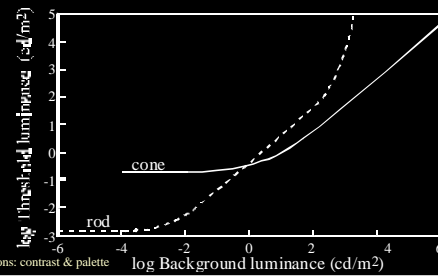
- [Ferwerda et al. 1996]
- Match the smallest perceptible intensity in the simulated scene and in the display condition
- Rod and cone vision

Limitations: contrast & palette

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Threshold

- Smallest perceptible stimulus
- Smallest perceptible stimulus difference



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Perceptual tone mapping

- [Ferwerda et al. 1996]



Limitations: contrast & palette

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Time-dependent tone mapping

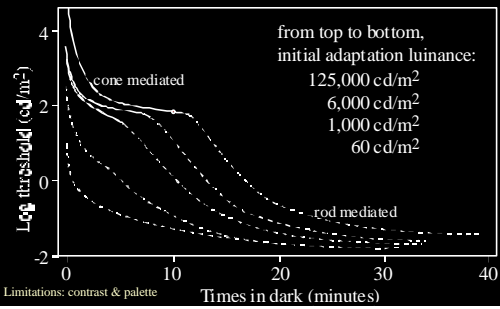
- Dazzling
- Slow dark adaptation

Limitations: contrast & palette

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Dark adaptation

- Slow recovery after dramatic decrement



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Time-dependent tone mapping



Limitations: contrast & palette

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Plan

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Limitations: contrast & palette

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Representing night scenes

- Rods, no color vision
- Blue shift
- Lower acuity
- Unable to adapt in shadows

Limitations: contrast & palette

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Representing night scenes

- Pissaro, Montmartre



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Representing night scenes

- James Abbott Mc Neil Whistler
Nocturne in Blue And Silver The Lagoon Venice
1879-1880



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Representing night scenes

- Whistler, *Old Battersea Bridge*



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Representing night scenes

- Archibald J. Motley Jr, *Gettin' Religion* 1948



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Night scenes in the movies

- Often *Day for night*
- Film during the day
- Few fill light (dark shadows)
- Add blue cast
- Avoid the sky

Limitations: contrast & palette

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Plan

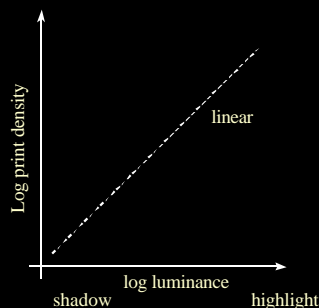
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Limitations: contrast & palette

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Tone Reproduction

- Not linear

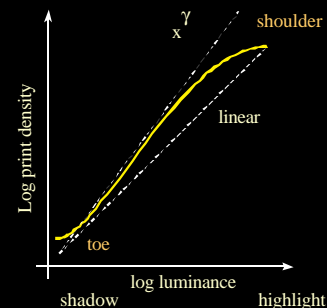


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Tone Reproduction

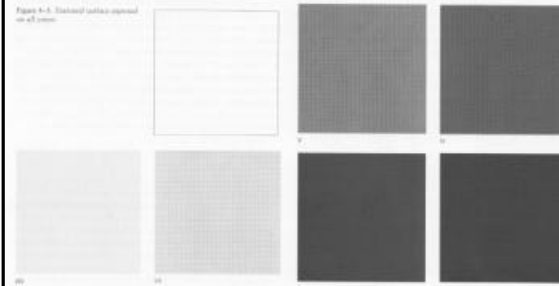
- Not linear
- Gamma correction



Limitations: contrast & palette

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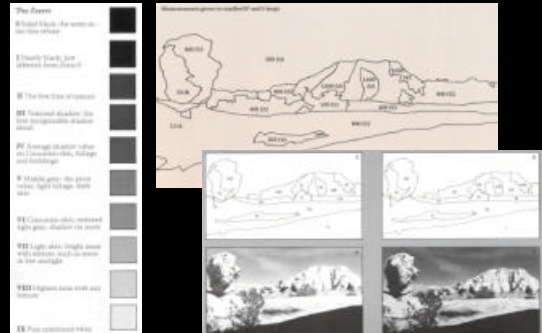
Texture and contrast



Limitations: contrast & palette

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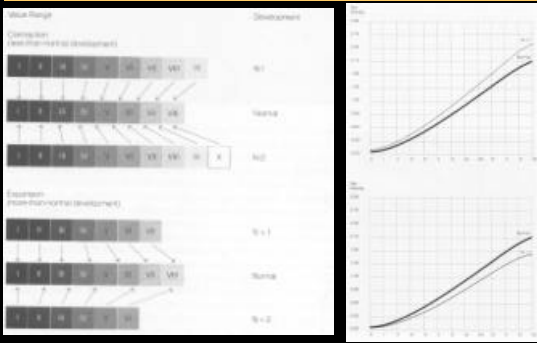
The Zone System



Limitations: contrast & palette

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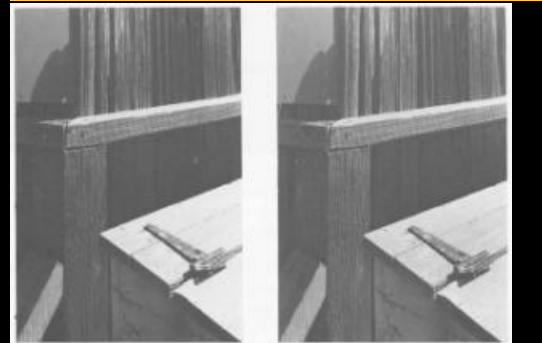
Expansion and contraction



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Contraction

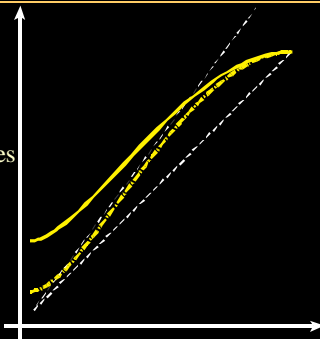


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Pre-exposure

- Expose with uniform white before taking the photo
- Raise the dark tones



Limitations: contrast & palette

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Pre-exposure

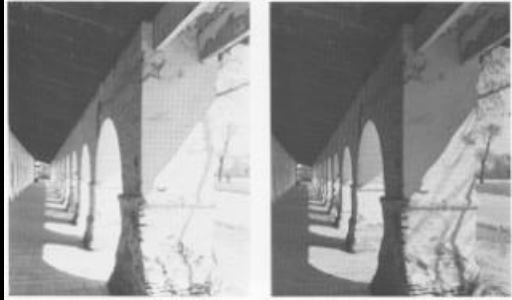


Limitations: contrast & palette

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Two-solution development

- Different development of high and low value



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Red Filter



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The Print

- W. Eugene Smith photo of Albert Schweitzer
- 5 days to print!

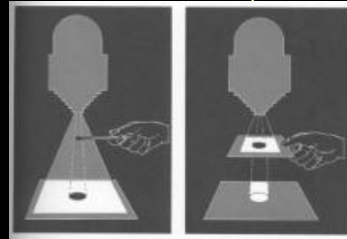


Limitations: contrast & palette

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Dodging and Burning

- Locally darken or lighten
- Use masks to expose some parts less
- Has to be done for each print!



Limitations: contrast & palette

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Dodging/burning



Limitations: contrast & palette

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Gradient Filter

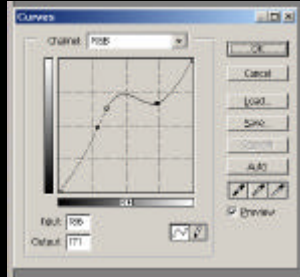
- The sky is too bright
 - Gradient filter for the top of the photo
- The house is too dark
 - Gradient filter for the bottom of the photo



Limitations: contrast & palette

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Curve tool in photo editing software



Limitations: contrast & palette

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The infamous 8 bits

- Digital photography
- 8 bits means 1 to 255 contrast
- Enough for display
- Not enough for
 - Editing
 - Tone reproduction
 - Dodging & burning
 - Etc.

Limitations: contrast & palette

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Plan

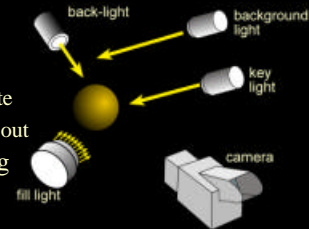
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Limitations: contrast & palette

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Three Point Lighting

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



Limitations: contrast & palette Shot-Perspective-Speed, aperture-Filer-Lighting-Processing & Print-Make up-Retouching

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Lighting

- Fill light



Limitations: contrast & palette

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Portrait Lighting

- Ansel Adams



Limitations: contrast & palette Shot-Perspective-Speed, aperture-Filer-Lighting-Processing & Print-Make up-Retouching

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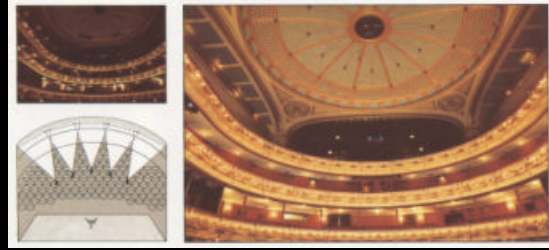
Fill-in



Limitations: contrast & palette
hot-Perspective-Speed, aperture-Filter-Lighting-Processing & Print-Make up-Retouching 67

Lighting

- Painting with light



Limitations: contrast & palette 68

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Limitations: contrast & palette 69

Local contrast



Limitations: contrast & palette 70

Local compensation

- Use local average to compensate
- Haloing effects



Limitations: contrast & palette 71

Local contrast

- [Tumblin 1999]
- Organization into regions



Limitations: contrast & palette 72

Local contrast

- [Tumblin 1999]
- Organization into regions

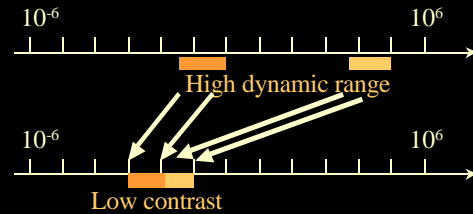


Limitations: contrast & palette

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Histogram adjustment

- [Larson et al. 1997]
- Disregard empty portions of the histogram

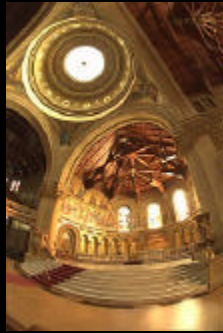


Limitations: contrast & palette

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Histogram adjustment

- [Larson et al. 1997]
- Disregard empty portions of the histogram



Limitations: contrast & palette

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Limitations: contrast & palette

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Flare, halo

- Le Corbusier, *Notre Dame du Haut*, 1950-55



Limitations: contrast & palette

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Flare, halo



Limitations: contrast & palette

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Flare, halo

- Van Gogh, *Le Semeur*, 1880



Limitations: contrast & palette

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Blue-yellow

- Karl Schulpig, 1925

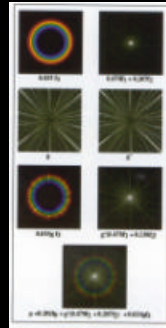
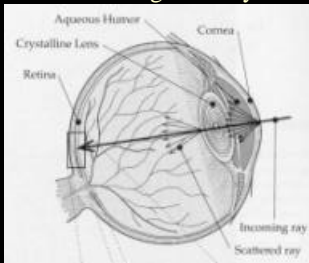


Limitations: contrast & palette

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Flare in CG

- [Spencer et al 1995]
- Flare: scattering in the eye

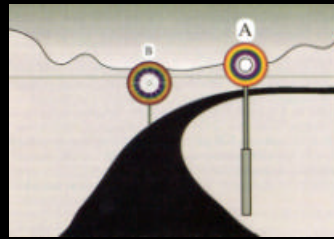


Limitations: contrast & palette

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Flare in CG

- [Spencer et al 1995]
- Flare: scattering in the eye
- Size is constant

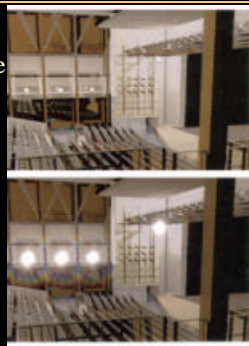


Limitations: contrast & palette

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Flare in CG

- [Spencer et al 1995]
- Flare: scattering in the eye
- Size is constant



Limitations: contrast & palette

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Limitations: contrast & palette

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Local lighting

- Typically Florence Renaissance
- Mostly to reveal shape
- Raphael



Limitations: contrast & palette

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Chinese painting



Limitations: contrast & palette

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Tenebrism

- Early 17th
- Caravaggio



Limitations: contrast & palette

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Rembrandt



Limitations: contrast & palette

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Radial balance

- Georges de La Tour,
Joseph the Carpenter,
1645



Limitations: contrast & palette

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White

- Filippo Lippi



Limitations: contrast & palette

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Silhouette

- Wolfrang Weber
The Lash Bird Dancer
On Madagascar
Late 20s



Limitations: contrast & palette

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Contrast

- Bert Stern



Limitations: contrast & palette

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Pure drawing

- Diego Riviera
Mother And Child
1936



Limitations: contrast & palette

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Pure color

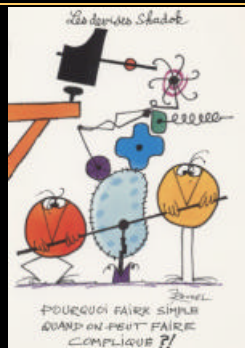
- Henri Matisse, *Harmony in Red*, 1908-1909



Limitations: contrast & palette

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Pure color



Limitations: contrast & palette

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