lighting workshop

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ARTD 2380 Video Basics
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Review of the homework

2. **Chapter 5. Light** in *Making Media: Foundations of Sound and Image Production* (Jan Roberts-Breslin, 4th ed., Focal Press, 2017)
   a. in classic three-point lighting, what is the role of each source?
      i. key light,
      ii. fill light,
      iii. background light,
      iv. backlight, and
      v. kickers.
   b. what's the difference between soft light and hard light?
   c. choosing lighting units based on their ability to produce hard or soft light
   d. transforming hard sources into soft sources
   e. What is the role of color temperature in lighting?
   f. What are the terms we use to describe sources of illumination?

Review of the homework

i. **Quantity** (Exposure, Contrast, Contrast Ratio, Dynamic Range, Inverse Square Law)

ii. **Quality** (Hard, Soft, Diffusion)

iii. **Direction/role** (Classic Three-Point Lighting, Key, Fill, Back, Kicker, Background, Practical, Chiaroscuro Lighting, Flat Lighting, Key-Fill Ratio, High Key Lighting, Low Key Lighting, Motivation)

iv. **Color** (Hue, Saturation, Brightness, Additive Color Mixing, Subtractive Color Mixing, Color Temperature, Tungsten, Daylight)

v. **Source** (Daylight, Artificial Sources, Existing Light, Added Light, Quartz-Halogen, Fluorescent, LED (COB or SMD), HMI, others)

How do we talk about **light?**

technical craft

- Role
- Contrast ratio
- Quality
- Intensity
- Direction
- Beam size
- Beam pattern
- Distance
- Color
- Source

storytelling

- What motivates the lighting?
- What mood does it set for the scene?
- What feelings does it evoke?

Starting points: **Video Playlist**

Cinematic lighting explained – Basics, tutorial and ultra-mobile lighting kit (Media Division, 2019, 24:30)

What is ”cinematic lighting” and why do you think so many media makers use this term?

Bao (Domee Shi, 2018, 08:00)

The story has dark and lighthearted elements, what role does the lighting play in helping to convey the emotional components of this story?

Starting points: **Observing and writing**

Train your eyes, Part 1. Analyze the lighting conditions around you.

What did you observe in terms of the quality, color, and direction of light?

Train your eyes, Part 2. Analyze the lighting conditions of a scene from a dramatic film or television episode.

Blade Runner (Ridley Scott, 1982)
Cinematographer: Jordan Cronenweth

What did you observe in terms of the quality, color, and direction of light?

Starting points: Self-assessment of **key concepts**

added light
additive color mixing
attenuate
background light
backlight
bicolor (instrument)
brightness
chrominance
color
color temperature
contrast
contrast range
contrast ratio
CTB (color temperature blue)
CTO (color temperature orange)
daylight (color temp.)
dynamic range
diffusion
existing light
exposure
eye light
fill light
filters
flat lighting
flood light
fluorescent lighting
foot-candle
Fresnel (instrument)
gel
hard light
high key lighting
highlights
histogram
hue
illuminance
illusion of depth
incandescent lighting
kicker
key:fill ratio, see lighting ratio
kelvin (color temperature)
key light
LED lighting
LED panel
lighting ratio
low key lighting
lumen
luminance
lux
midtones
motivated lighting
neutral density
overexposure
practical
reflector
representational lighting
saturation
soft box
soft (a.k.a. diffused) light
spotlight
subtractive color mixing
three-point lighting
tungsten (color temp.)
underexposure
waveform monitor
white balance
zebras

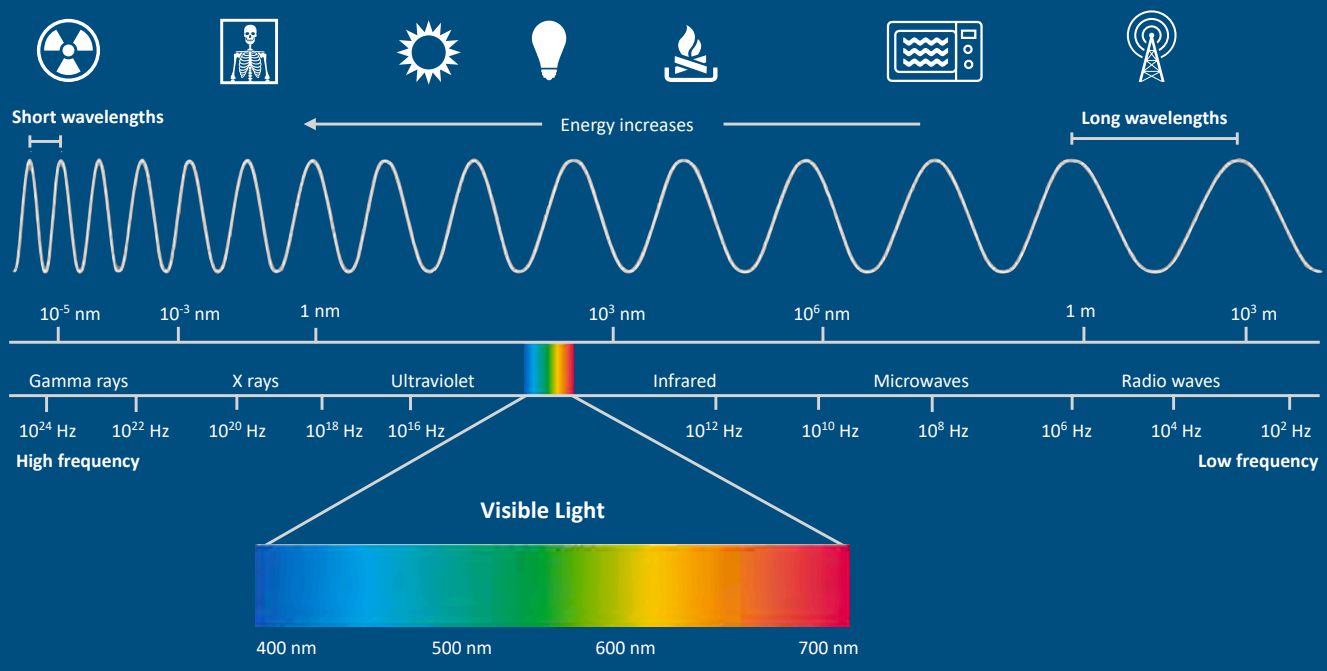
What is light?

Image by Michael Held (CC-0)

What is light?

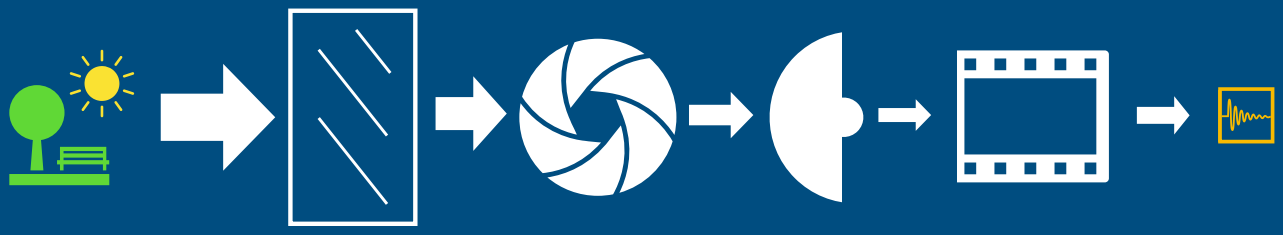
Image by Jonathan Borba (CC-0)

What is light?



Based on *Light and Color* by By R. Daniel Overheim and David L. Wagner (Wiley, 1982)

The pathway of light

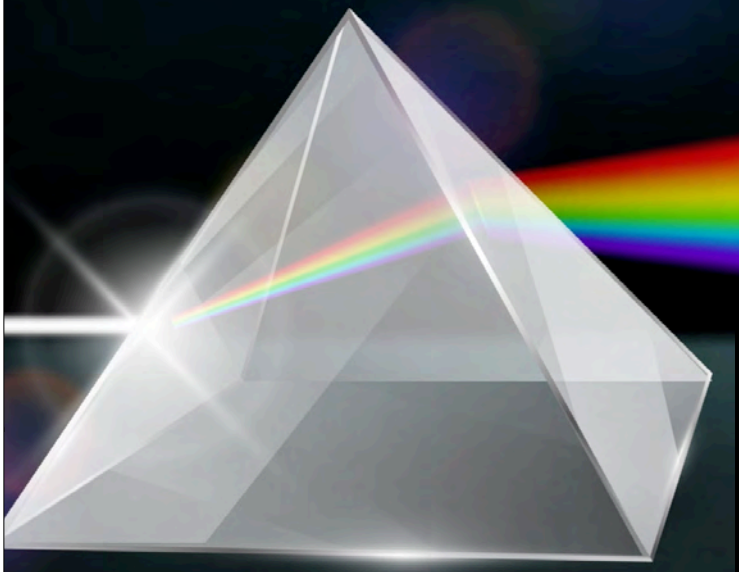


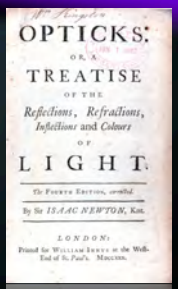
Scene Illumination | ND Filters | Aperture | Shutter | Sensor (base ISO) | Gain/ISO

What is color?

Image by Mika Baumeister (CC-0)

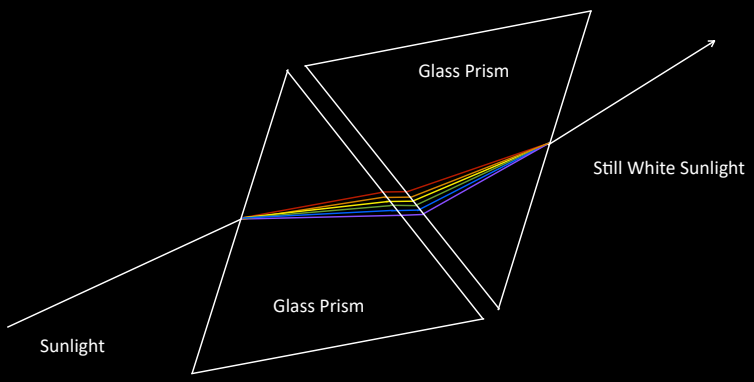
Spectral color



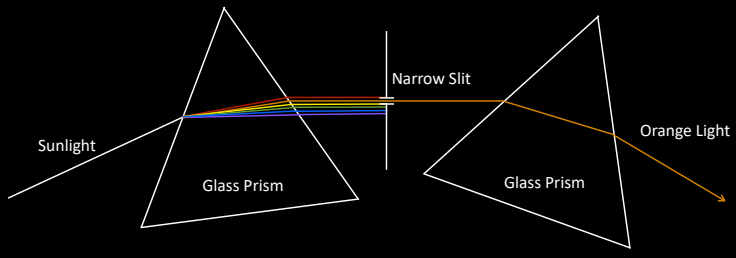


Source: Science Sparks, https://www.science-sparks.com/rainbow-with-a-prism/ (©)

Spectral color



Newton's color circle



Based on *Light and Color* by By R. Daniel Overheim and David L. Wagner (Wiley, 1982)

Reflected color

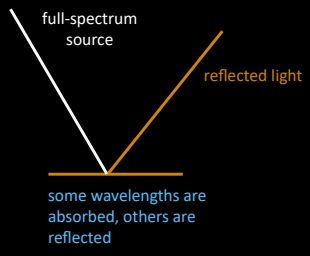
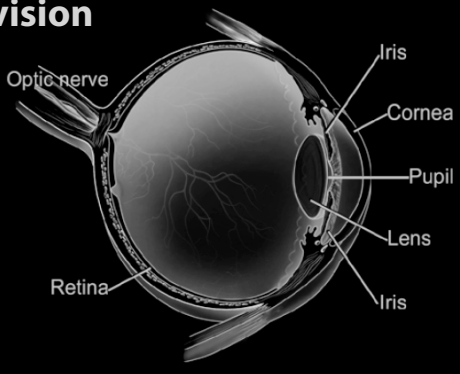
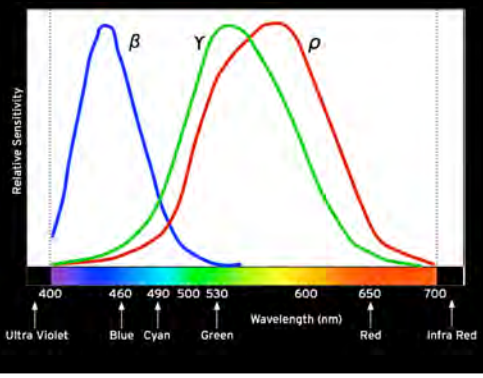
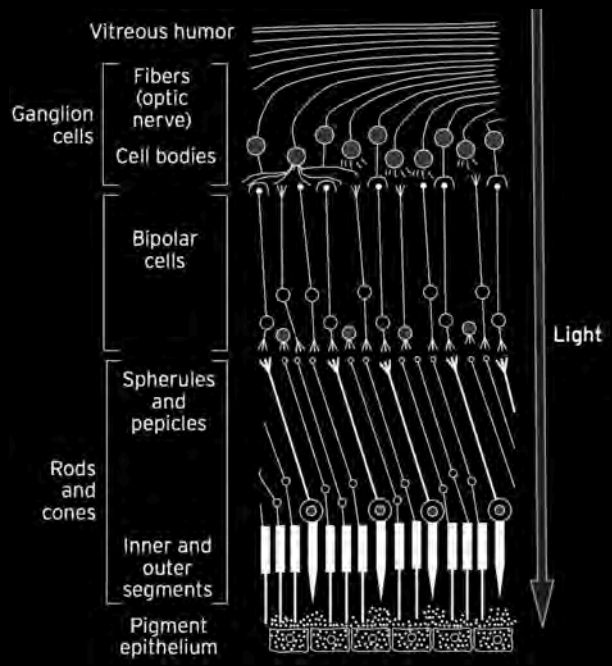


Image: Liz West: Our Colour Reflection, Installation, 2016 - 2020, https://www.liz-west.com/our-colour-reflection

Color vision



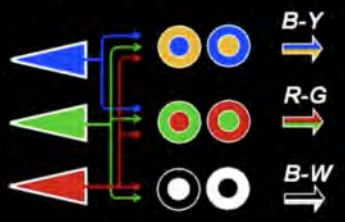




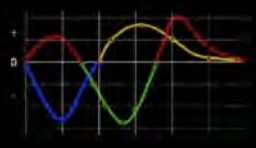
Based on *Light and Color* by By R. Daniel Overheim and David L. Wagner (Wiley, 1982)

Color vision

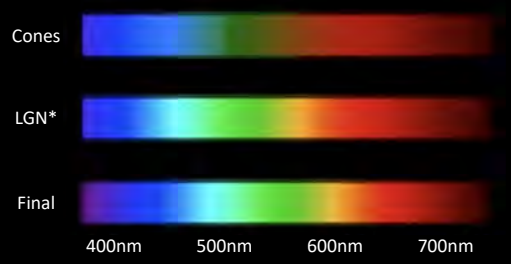
Stage 1: Color Opponents in the Retina

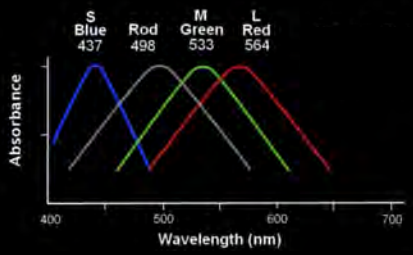


Stage 2: Color Opponents in the Cortex

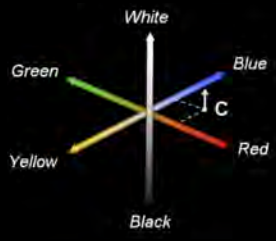


Color Spectrum as we perceive it





CONE AND ROD SPECTRUM



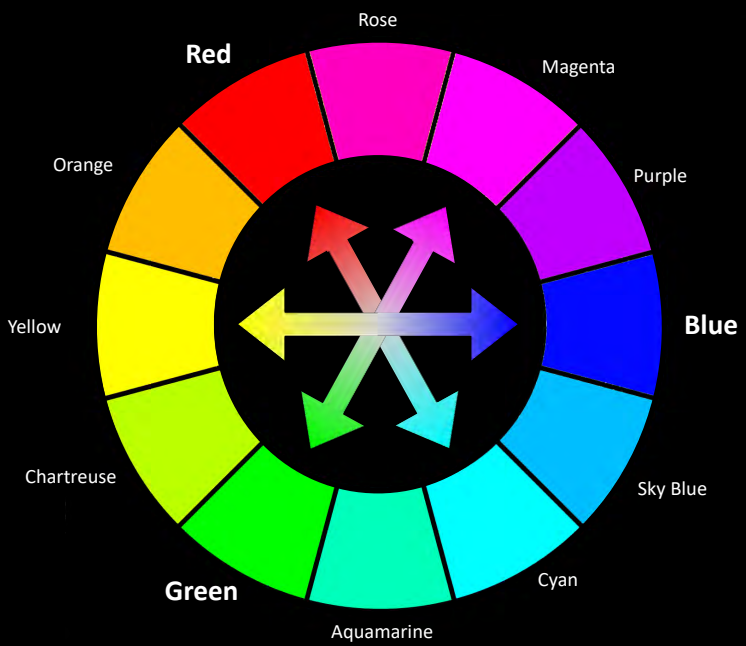
OPPONENT COLORS

UNIQUE HUES

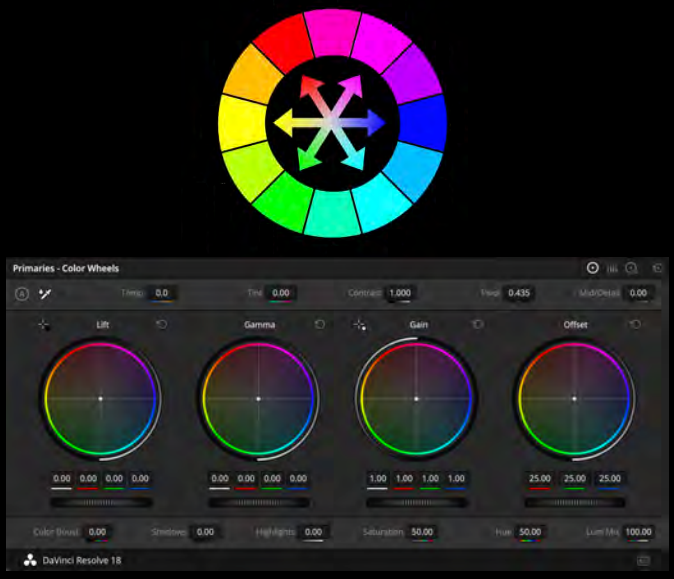
Images from Blackwell (2012), Based on *Light and Color* by By R. Daniel Overheim and David L. Wagner (Wiley, 1982)

* the Lateral geniculate nucleus (LGN) is the primary thalamic nucleus that relays visual information from the retina to the primary visual cortex

Color wheel (opponent colors)



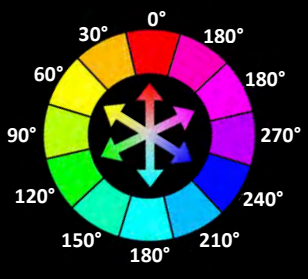
Color wheels in postproduction software



DaVinci Resolve Color Page

Adobe Premiere Pro Lumetri Color Panel

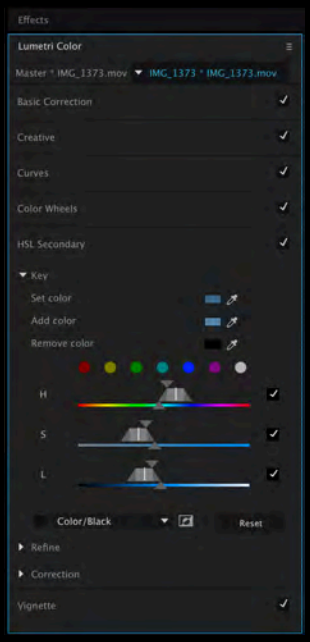
HSL: hue, saturation, and lightness



Hue: 0° → 360°

Saturation: 0% → 100%

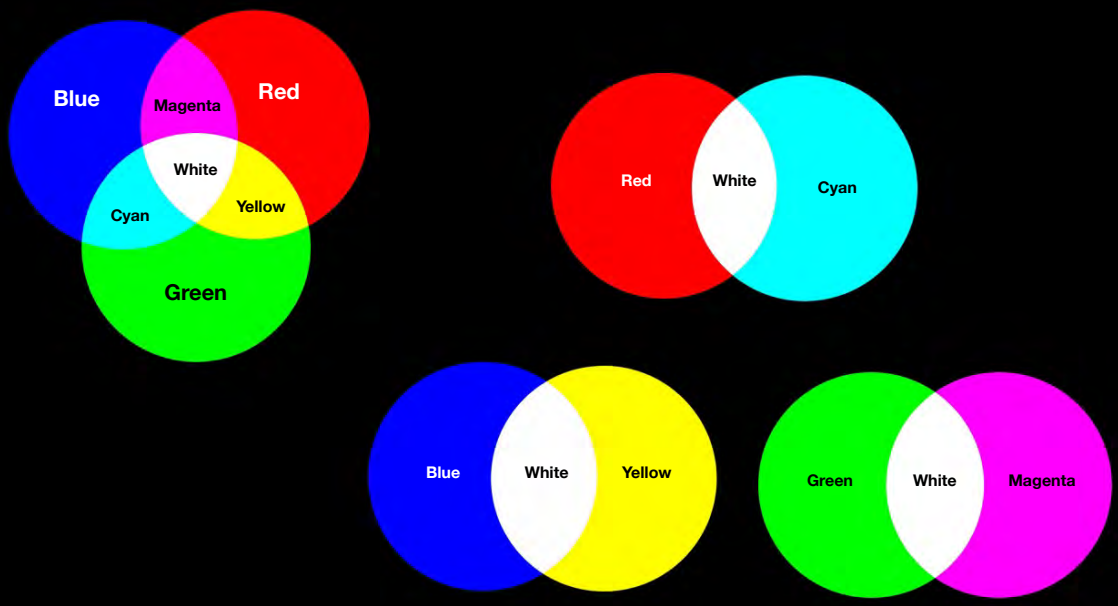
Lightness: 0% → 100%



HSL Controls in Lumetri

Image: What is HSL Color? by Nix Color Sensor and HSL: Hue, Saturation, and Light by Tom Jewett

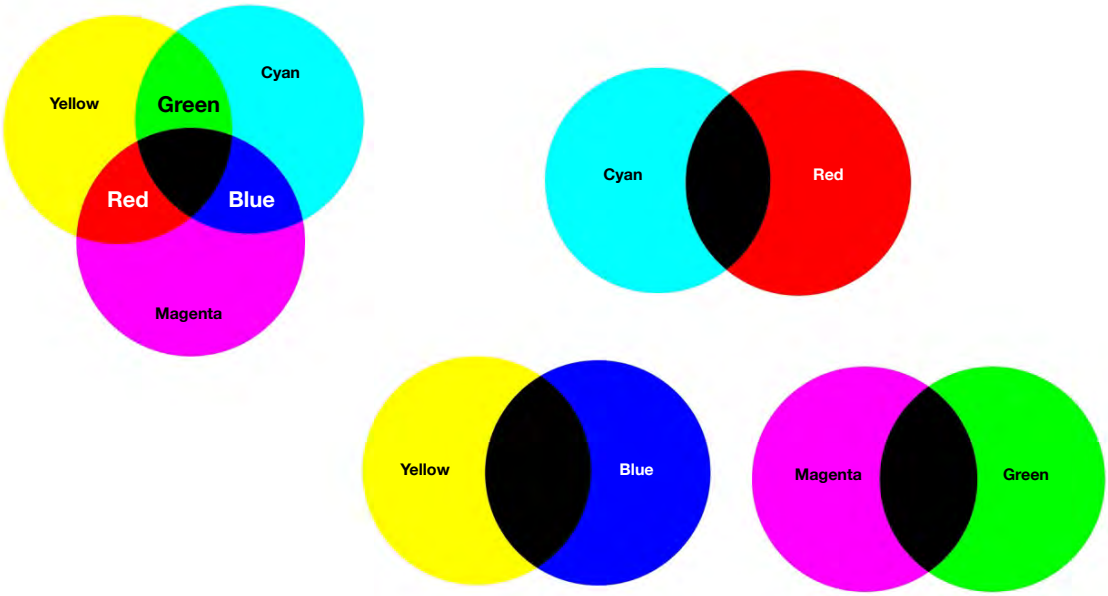
Additive color



Color of emissive sources (additive color mixing)

Image: Alienware

Subtractive color



Color of reflected surfaces (subtractive color)

Image source: DK find out! ©

Color of reflected surfaces (subtractive color)

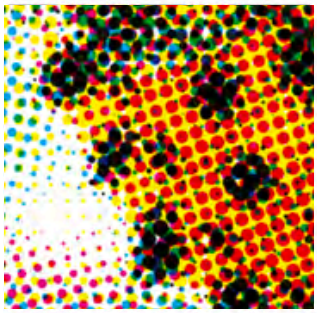
CYAN

MAGENTA

YELLOW

BLACK

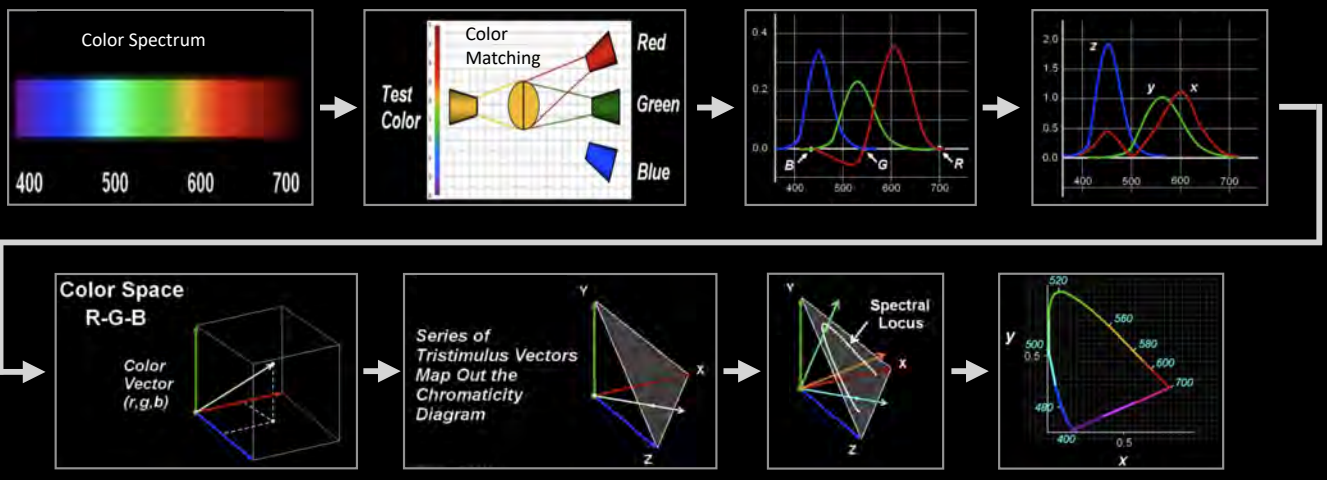
FINAL CMYK



DETAIL VIEW

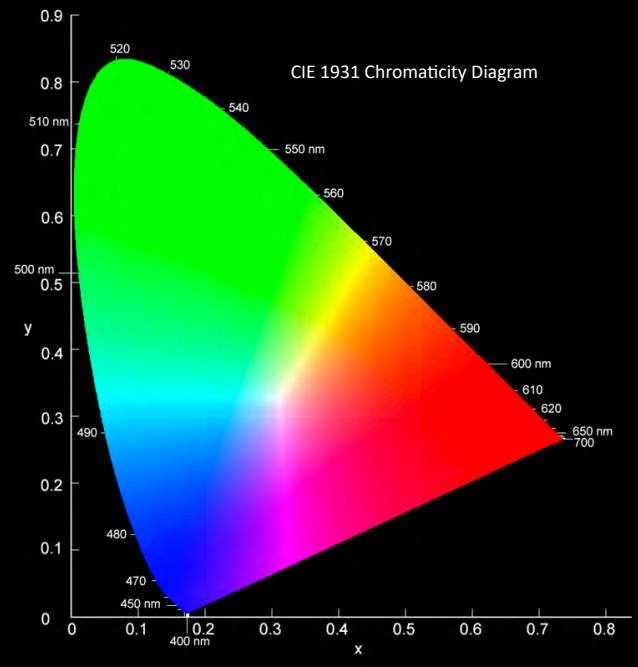
Source: Everything You Need to Know About CMYK, PS Printing; https://printingsolutions.com/cmyk-printing/

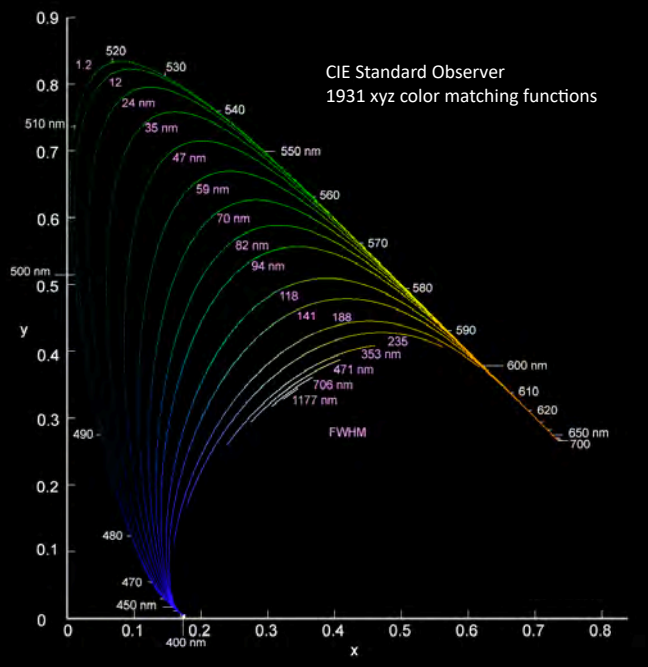
Describing color: how the CIE model was created



Based on Blackwell (2021) and A Beginner's Guide to (CIE) Colorimetry by Chandler Abraham, https://medium.com/hipster-color-science/a-beginners-guide-to-colorimetry-401f1830b65a and Light and Color by By R. Daniel Overheim and David L. Wagner (Wiley, 1982).

Describing color: CIE Standard Observer 1931 color matching functions





Based on The Color Series by Roger N Clark, https://clarkvision.com/articles/color-cie-chromaticity-and-perception/ and Light and Color by By R. Daniel Overheim and David L. Wagner (Wiley, 1982).

Anatomy of the **CIE Chromaticity Diagram**

All of the colors visible to the average human eye are contained inside this diagram.

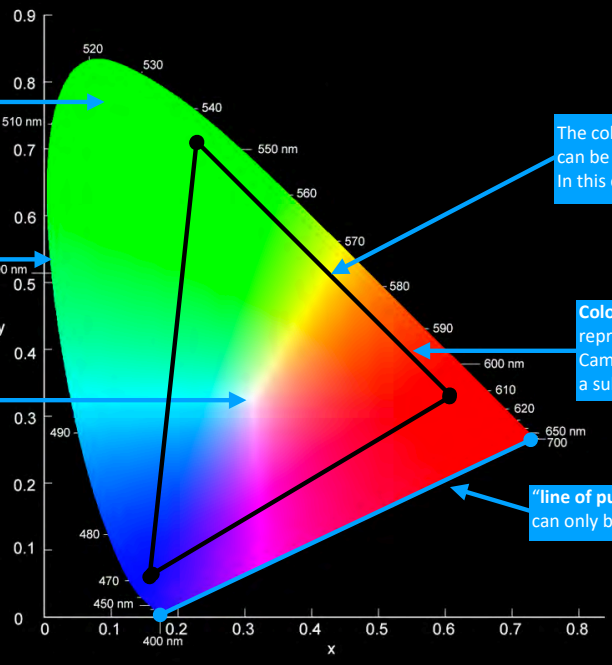
The edge of the diagram is called the **spectral locus**, represents pure, monochromatic light measured by wavelength in nanometers. These are the most saturated colors.

The least saturated colors are at the center, emanating from white.

The colors along any line between any two points can be made by mixing the colors at the end points. In this case, Green + Red = Yellow.

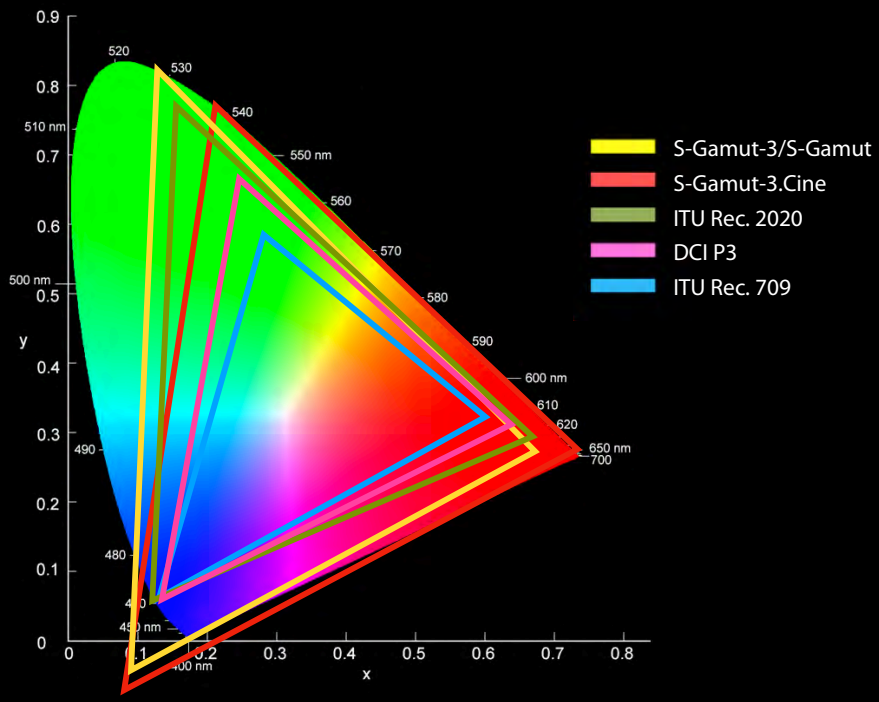
Color gamut: subset of colors that can be represented by mixing the colors at it's corners. Cameras and displays have a color gamut that is a subset of what the human eye can perceive.

"line of purples": these colors are fully saturated but can only be made by mixing two colors (red and blue)



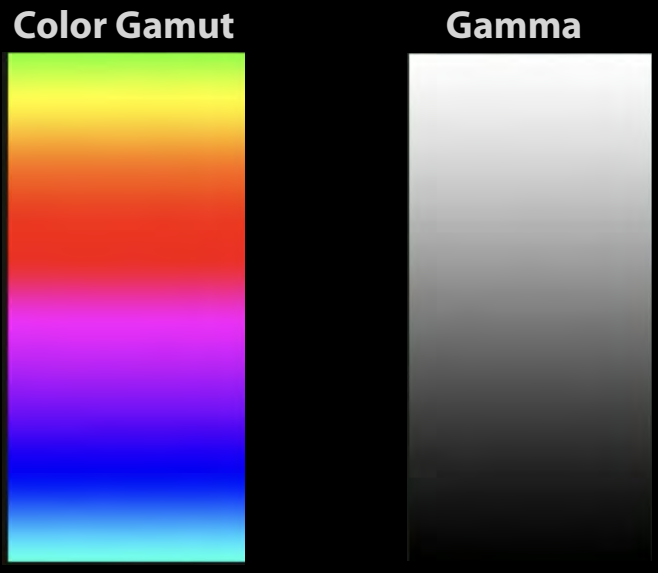
Based on The Color Series by Roger N Clark, https://clarkvision.com/articles/color-cie-chromaticity-and-perception/ and Light and Color by By R. Daniel Overheim and David L. Wagner (Wiley, 1982).

Color gamut



Based on The Color Series by Roger N Clark, https://clarkvision.com/articles/color-cie-chromaticity-and-perception/ and Light and Color by By R. Daniel Overheim and David L. Wagner (Wiley, 1982).

Gamma



Camera gamma and display gamma

1

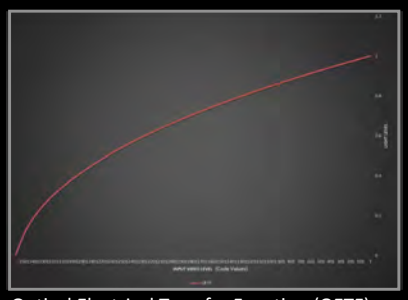
2

Gamma curve images courtesy of Sony.

Camera gamma and display gamma

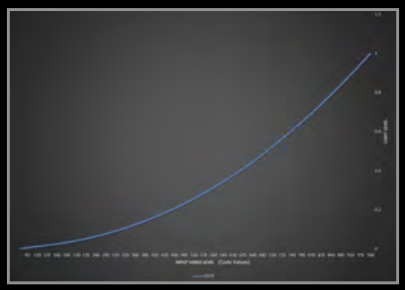
Camera Gamma → Monitor Gamma → Human Obsever

Camera = Scene Referred (OETF)



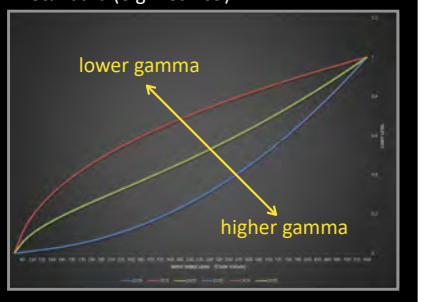
Optical Electrical Transfer Function (OETF) defines the relationship between relative scene light and the encoded value

Monitor = Display Referred (EOTF)



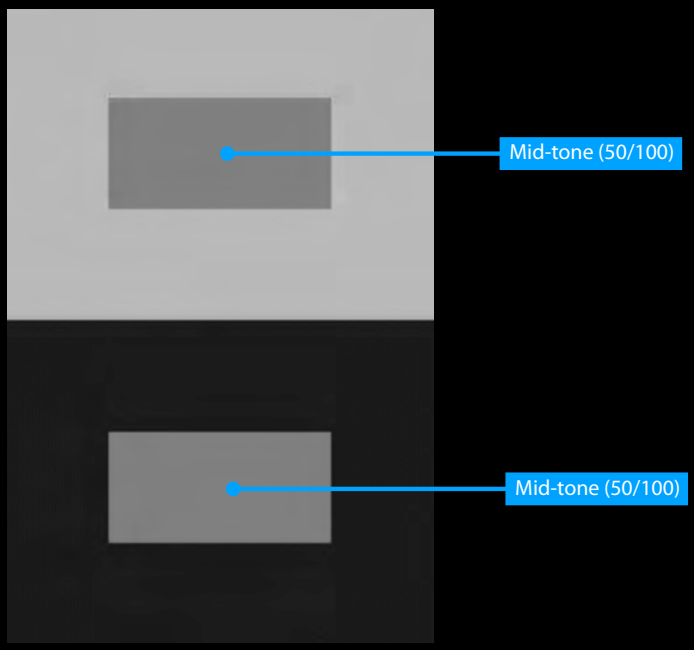
Electrical Optical Transfer Function (EOTF) defines the relationship between code values and display light

OOTF = Scene Referred + Display Referred + Standard (e.g. Rec.709)

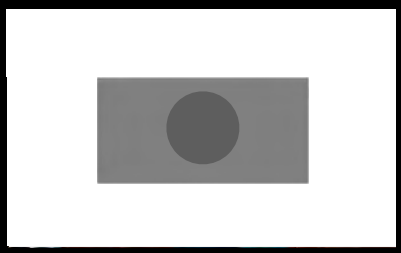


Gamma curve images courtesy of Sony.

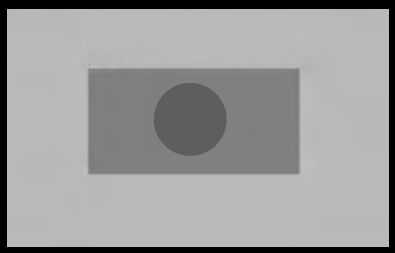
Simultaneous contrast



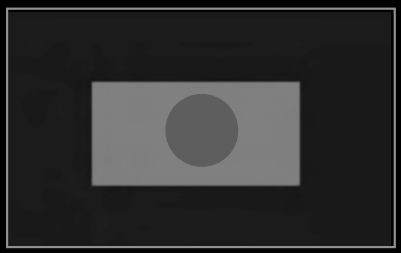
Simultaneous contrast and viewing conditions



bright viewing conditions



darker viewing conditions

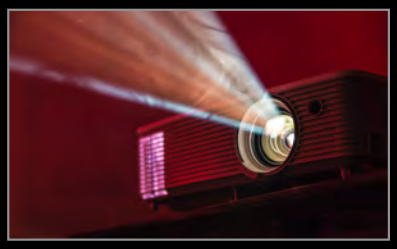


'blacked out' viewing conditions

Display gamma standards

Gamma 2.2 for bright viewing conditions

Gamma 2.4 for darker viewing conditions



Gamma 2.6 is used for 'blacked out' viewing conditions

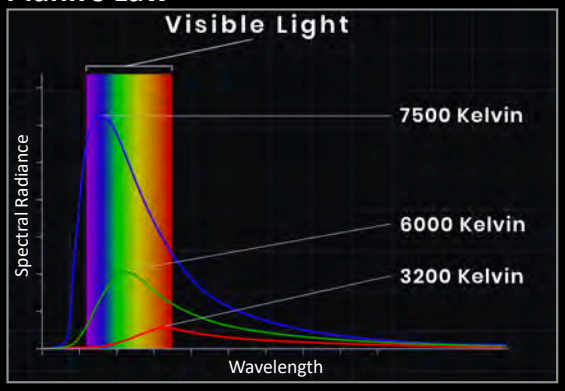
Images TBD

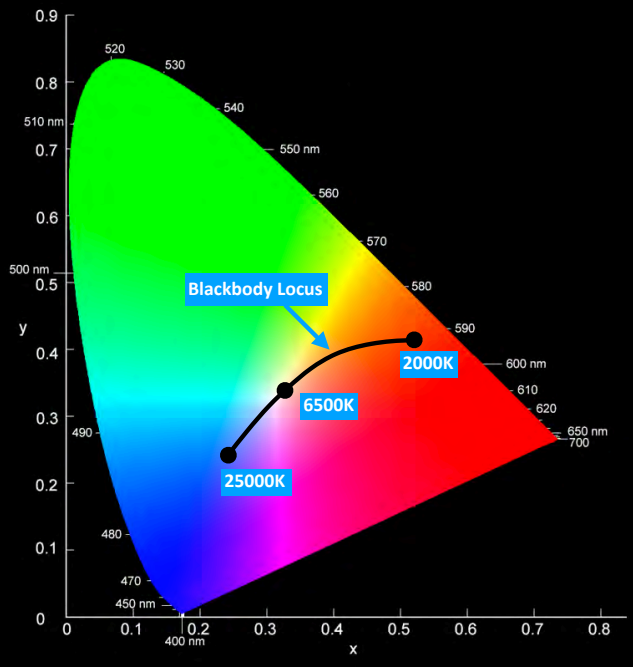
Common color temperatures

Based on Light and Color by R. Daniel Overheim and David L. Wagner (Wiley, 1982) ;
Images (Unsplash, CC-0): Candle by Basil James; Golden Hour by Davide Pietralunga; Kitchen by Sidekix Media; Outdoors by Sébastien Goldberg; Overcast by Chris Leipelt; Heavy Overcast by Luke Stackpoole.

Color temperature

Plank's Law





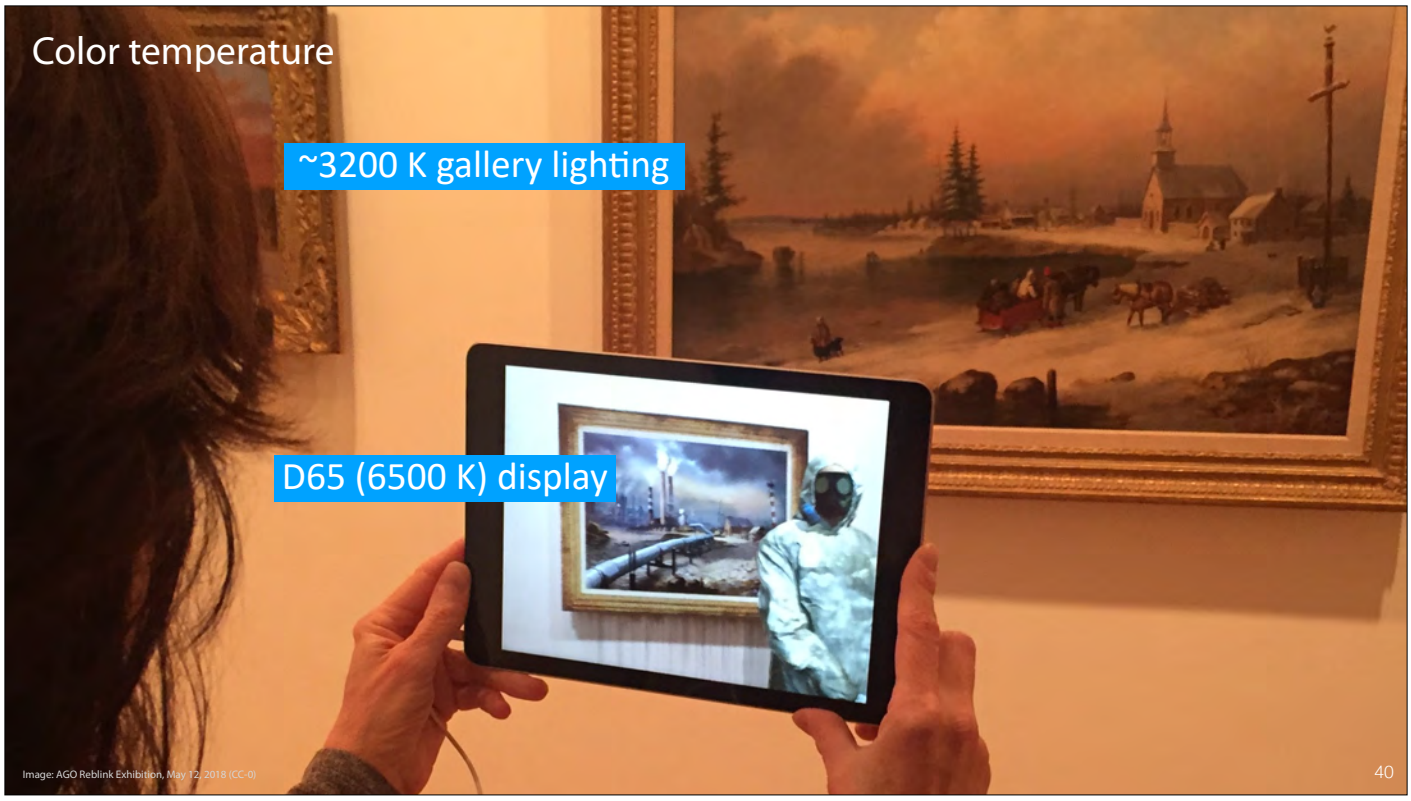
Based on Light and Color by R. Daniel Overheim and David L. Wagner (Wiley, 1982).

Color temperature of lighting units

* film/video production standards

Image: Lumega blog, https://lumega.eu/blog/a-world-of-lighting-what-is-color-temperature/

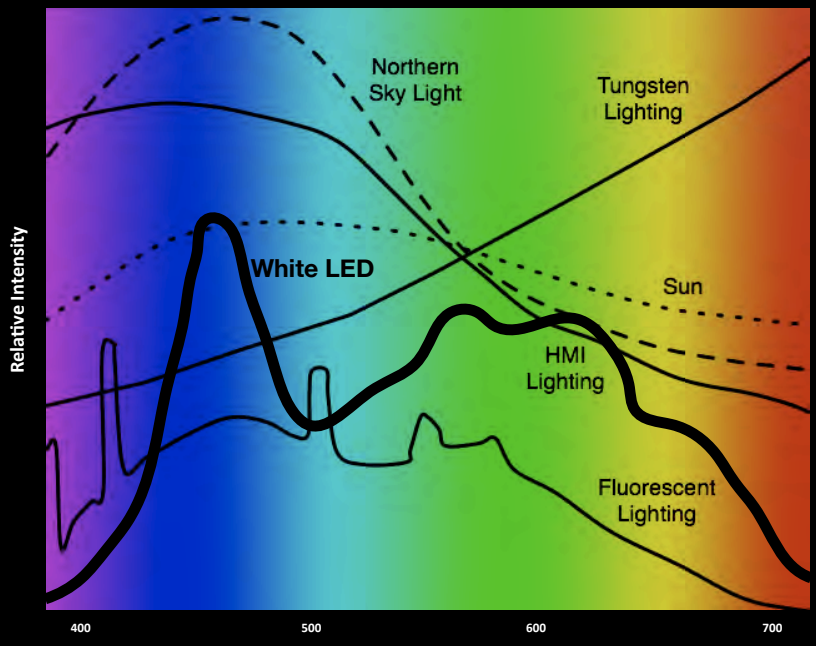

Color temperature
warm interior lighting
daylight
Image: Yuki (CC-0)


Color temperature
~3200 K gallery lighting
D65 (6500 K) display
Image: AGO Reblink Exhibition, May 12, 2018 (CC-0)


Color temperature
yellowish white LEDs
~6000 K daylight
Image: Spencer Finch: Cosmic Latte (2017); installation at MASS MoCA, photo by David Tamés (CC-0)
41


Color temperature
~6500 K (lit by direct sunlight)
10,000+ K shadows (lit by skylight)
Image: NC (CC-0)
42

Spectral response of light sources



Spectral chart from *Light and Color* by By R. Daniel Overheim and David L. Wagner (Wiley, 1982)

Spectral response of light sources: **Color Rendering Index (CRI)**

CRI over **90**
accurate color rendering

CRI between **80** and **90**
color rendering acceptable
in non-critical applications

CRI below **65**
poor color rendering

CRI ratings of common light sources:

- Sodium street lighting: negative
- Halophosphate warm-white fluorescent: 51
- Halophosphate cool-white fluorescent: 64
- Tri-phosphor warm-white fluorescent: 73
- Standard LED lamp: 83
- Quartz metal halide: 85
- Fluorescent designed for video production or photography: 90
- LED designed for video production or photography: 95
- Quartz-Halogen bulb: 100

CRI data from Wikipedia; CRI comparison from https://www.superbrightleds.com/blog/what-is-cri/849/ (©); Apple Images by Westinghouse Lighting (©)

Color

LOVE

PASSION

VIOLENCE

DANGER

ANGER

POWER

Image collage from "The Psychology of Color in Film" by Studio Binder ©

Color

INNOCENCE

SWEETNESS

FEMININITY

PLAYFUL

EMPATHY

BEAUTY

Image collage from "The Psychology of Color in Film" by Studio Binder ©

Color

WARMTH

SOCIABILITY

FRIENDLY

HAPPINESS

EXOTIC

YOUTH

Image collage from "The Psychology of Color in Film" by Studio Binder ©

Color

MADNESS

SICKNESS

INSECURITY

OBSESSIVE

IDYLLIC

NAIVE

Image collage from "The Psychology of Color in Film" by Studio Binder ©

Color

NATURE

IMMATURITY

CORRUPTION

OMINOUS

DARKNESS

DANGER

Image collage from "The Psychology of Color in Film" by Studio Binder ©

Color

COLD

ISOLATION

CEREBRAL

MELANCHOLY

PASSIVITY

CALM

Image collage from "The Psychology of Color in Film" by Studio Binder ©

Color

FANTASY

ETHEREAL

EROTICISM

ILLUSORY

MYSTICAL

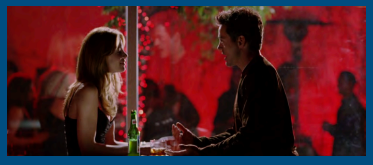
OMINOUS

Image collage from "The Psychology of Color in Film" by Studio Binder ©

Terms of Enlightenment: **role** of light source in classic three-point lighting

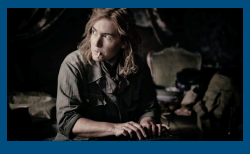
Key Light

Fill Light

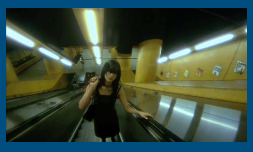


Backlight

Kicker



Background light



Existing Light

Practical

Terms of Enlightenment: **Key light**

Ghost in the Shell (Rupert Sanders, 2017)
Cinematographer: Jess Hall

Terms of Enlightenment: **Fill light**

The Piano (Jane Campion, 1993)
Cinematographer: Stuart Dryburgh

Terms of Enlightenment: **Existing light**

Fallen Angels (Kar-Wai Wong, 1995)
Cinematographer: Christopher Doyle

Terms of Enlightenment: **Backlight**

Kiss Kiss Bang Bang (Shane Black, 2005)
Cinematographer: Michael Barrett

Terms of Enlightenment: **Kicker**

The Godfather (Francis Ford Coppola, 1972)
Cinematographer: Gordon Willis

Terms of Enlightenment: **Background light**

The Betrayal (Ellen Kuras & Thavisouk Phrasavath, 2008)
Cinematographer: Ellen Kuras

Terms of Enlightenment: **Practical**

Another Year (Mike Leigh, 2010)
Cinematographer: Dick Pope

Terms of Enlightenment: **Direction**

1

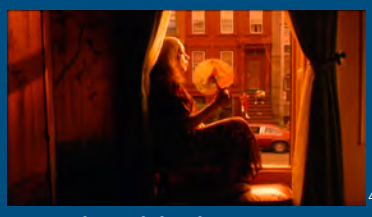
frontal lighting

2

45° lighting

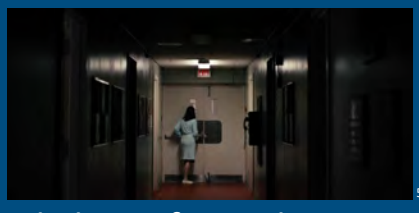
3

90° lighting



4

backlighting



5

lighting from above

6

lighting from below

Image Sources: 1. ***The Unbearable Lightness of Being*** (Philip Kaufman, 1988) Cinematographer: Sven Nykvist; 2. ***Casablanca*** (Michael Curtiz, 1942), Cinematographer: Arthur Edeson; 3. ***Pandora's Box*** (Georg Wilhelm Pabst, 1929), Cinematographer: Günther Krampf ; 4. ***Do the Right Thing*** (Spike Lee, 1989), Cinematographer: Ernest Dickerson; 5. ***The Blackcoat's Daughter*** (Oz Perkins, 2015), Cinematographer: Julie Kirkwood; 6. ***The Fly*** (David Cronenberg, 1986), Cinematographer: Mark Irwin.

Terms of Enlightenment: **Key Light** (variations of three-point lighting)

"Hollywood lighting"

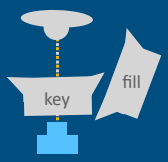
"loop lighting"

"Rembrandt lighting"

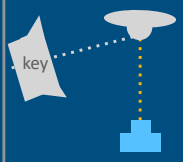
"split lighting"

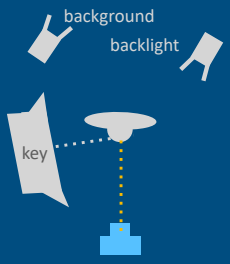
"profile lighting"

This example has no back or background light but there is no reason not to use them.

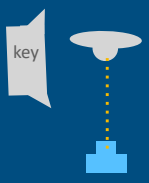


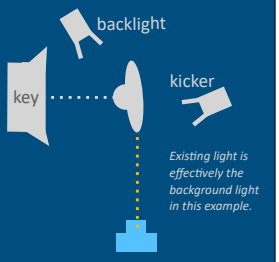
This example has no back or background light but there is no reason not to use them.





This example has no back or background light but there is no reason not to use them.





Existing light is effectively the background light in this example.

Terms of Enlightenment: **Contrast Ratio**

1:1

2:1

1 stop

4:1

2 stops

8:1

3 stops

16:1

4 stops

Source: The Audio Buzz Blog

Terms of Enlightenment: **High Key** vs. **Low Key** Lighting

High Key

Bruce Almighty (Tom Shadyac, 2003)
Cinematographer: Dean Semler

Low Key

Citizen Kane (Orson Welles, 1941)
Cinematographer: Greg Toland

Terms of Enlightenment: **Quality**

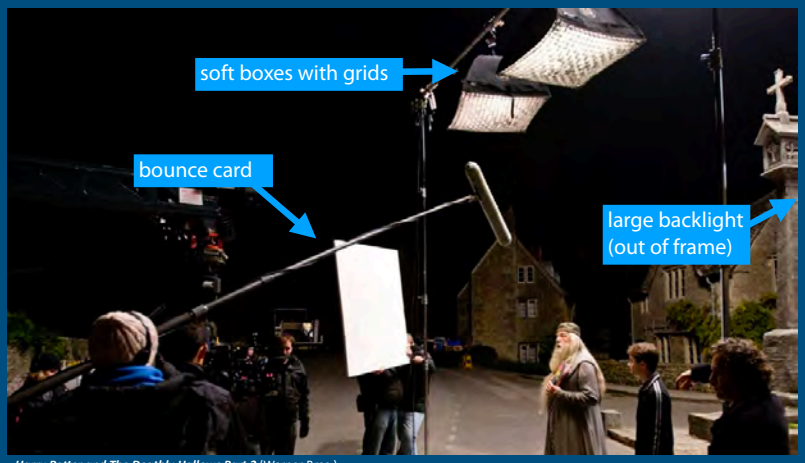
large source = **soft quality**

A Match in the Rain (Stephen Jobes, 1999)
Cinematographer: David Tamés

small source = **hard quality**

Terms of Enlightenment: **Quality**

large source = **soft quality**

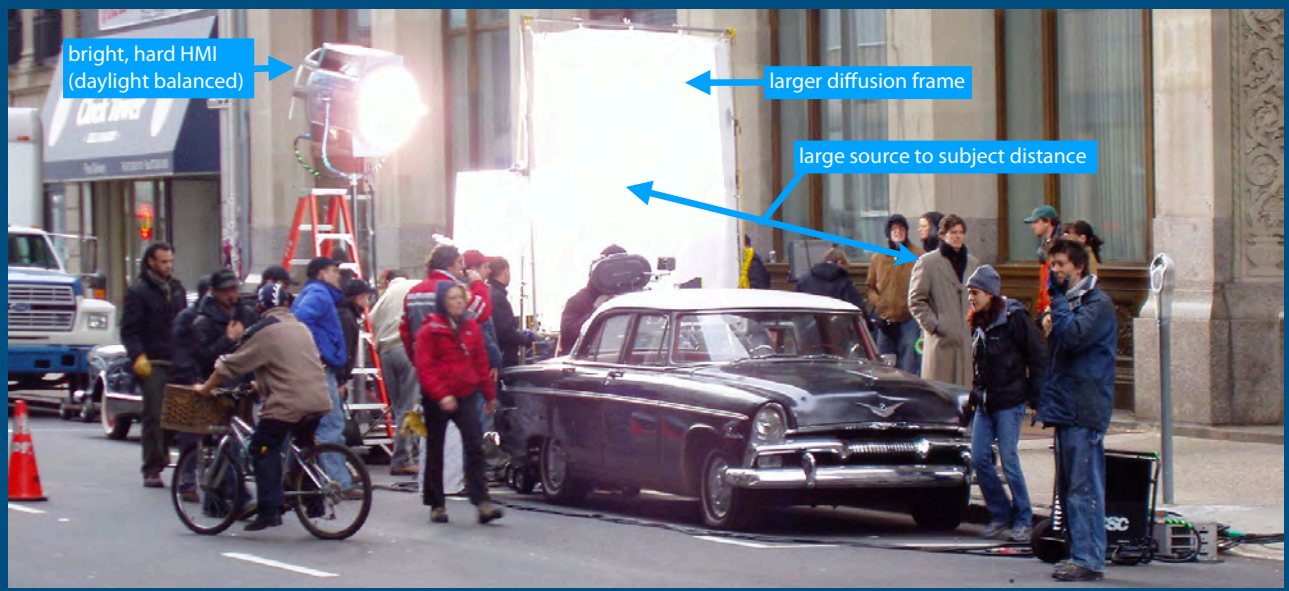


Harry Potter and The Deathly Hallows Part 2 (Warner Bros.)

small source = **hard quality**

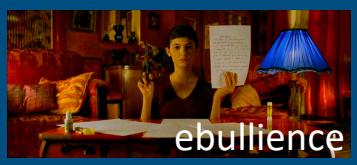
Source TBD

Terms of Enlightenment: **Quality**



MTV movie production on location in Newark, photo by Derek Jensen (CC-A)

We can use lighting to evoke **mood**, **time of day**, **period**, and more



We can use lighting to evoke **mood**, **time of day**, **period**, and more*

Top Gun Maverick (Paramount Pictures)

Speed Racer (Warner Bros.)

Barbie (Warner Bros.)

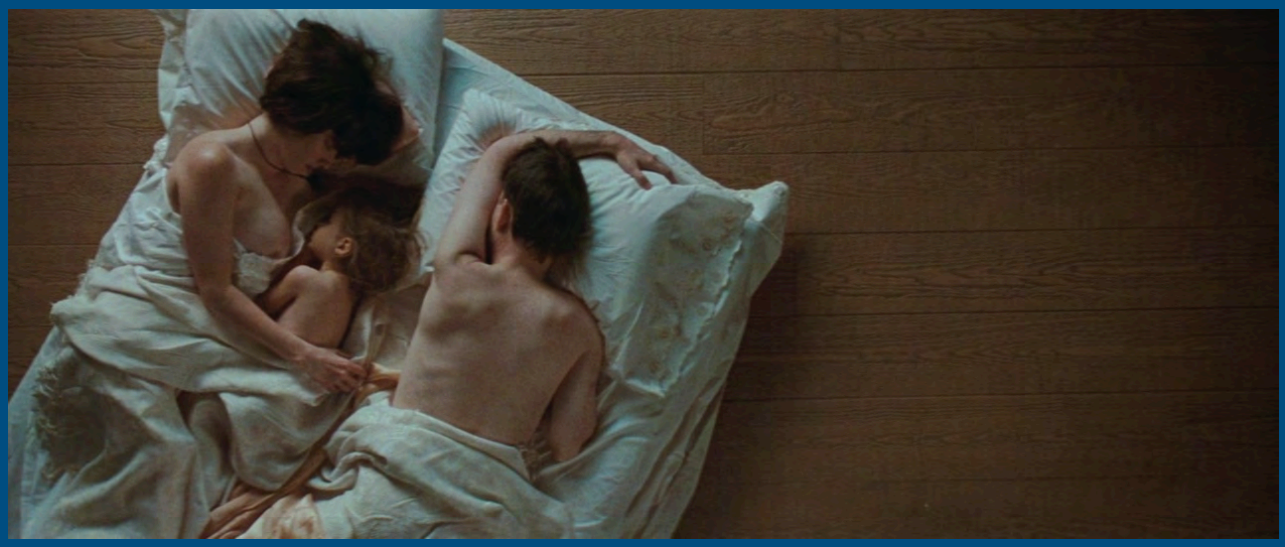
Revolutionary Road (DreamWorks)

The Power of the Dog (Netflix)

The Power of the Dog (Netflix)

* **lighting does not function alone**, it works in conjunction with composition camera movement, blocking, production design, location, visual effects, color grading, visual textures (e.g. film grain), and more.

We can use lighting to evoke mood, for example, **tranquility**



The Sweet Hereafter (Atom Egoyan, 1997)
Cinematographer: Paul Sarossy

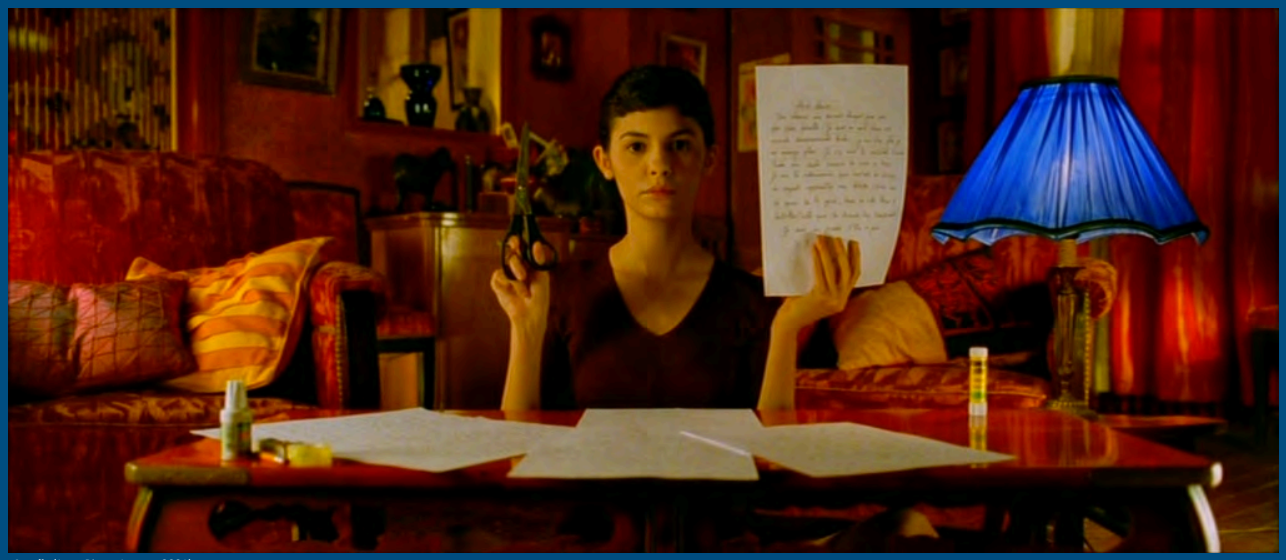
We can use lighting to evoke mood, for example, **loneliness**

Chung King Express (Kar-Wai Wong, 1994)
Cinematographers: Christopher Doyle and Lau Wai-Keung

We can use lighting to evoke mood, for example, **danger and mystery**

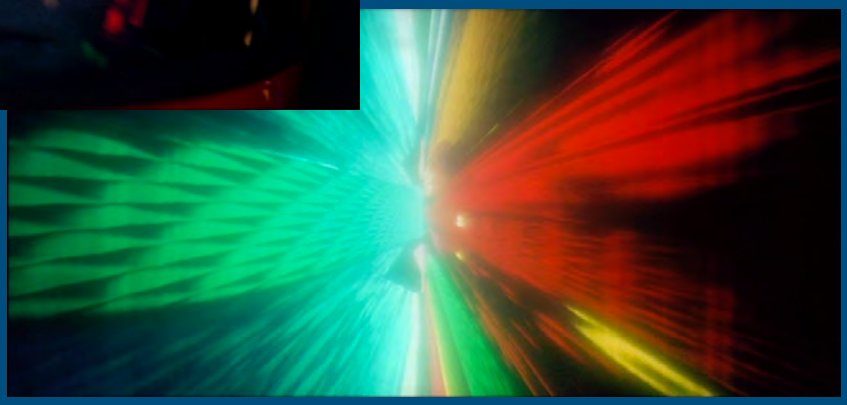
The Matrix (The Wachowskis, 1999)
Cinematographer: Bill Pope

We can use lighting to evoke mood, for example, **ebullience**



Amelie (Jean-Pierre Jeunet, 2001)
Cinematographer: Bruno Delbonnel

We can use lighting to evoke mood, for example, **transcendence**



2001: A Space Odyssey (Stanley Kubrick, 1968)
Cinematographers: Geoffrey Unsworth and John Alcott

We can use lighting to evoke **time of day**

High Noon

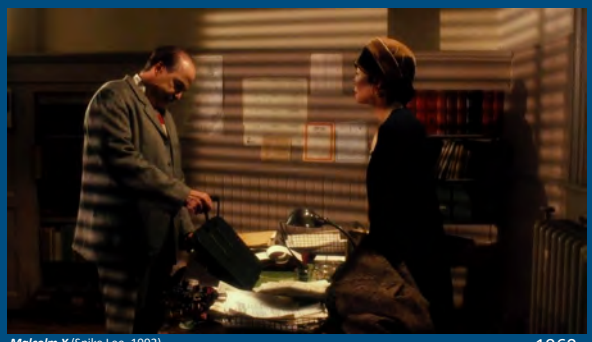
Afternoon

Night interior

Night exterior

The Good, The Bad And The Ugly (Sergio Leone, 1966)
Cinematographer: Tonino Delli Colli

We can use lighting to evoke the **historical period**



Malcolm X (Spike Lee, 1992)
Cinematographer: Ernest Dickerson
1960s

The Thin Red Line (Terrence Malick, 1999)
Cinematographer: John Toll
1940s

The Power of the Dog (Jane Campion, 2021)
Cinematographer: Ari Wegner
1920s

Barbie (Greta Gerwig, 2023)
Cinematographer: Rodrigo Prieto
contemporary

Creartive use of color temperature

Skyfall (Sam Mendez, 2012)
Clnematographer: Roger Deakins

Skyfall (Sam Mendez, 2012)
Clnematographer: Roger Deakins


Even when we're not using lighting instruments, we're lighting. Whenever possible, seek the camera position relative to the subject that provides the best lighting.
Latitude Zero: Ecuador and the Galapagos Dialogue of Civilizations, Summer II 2016

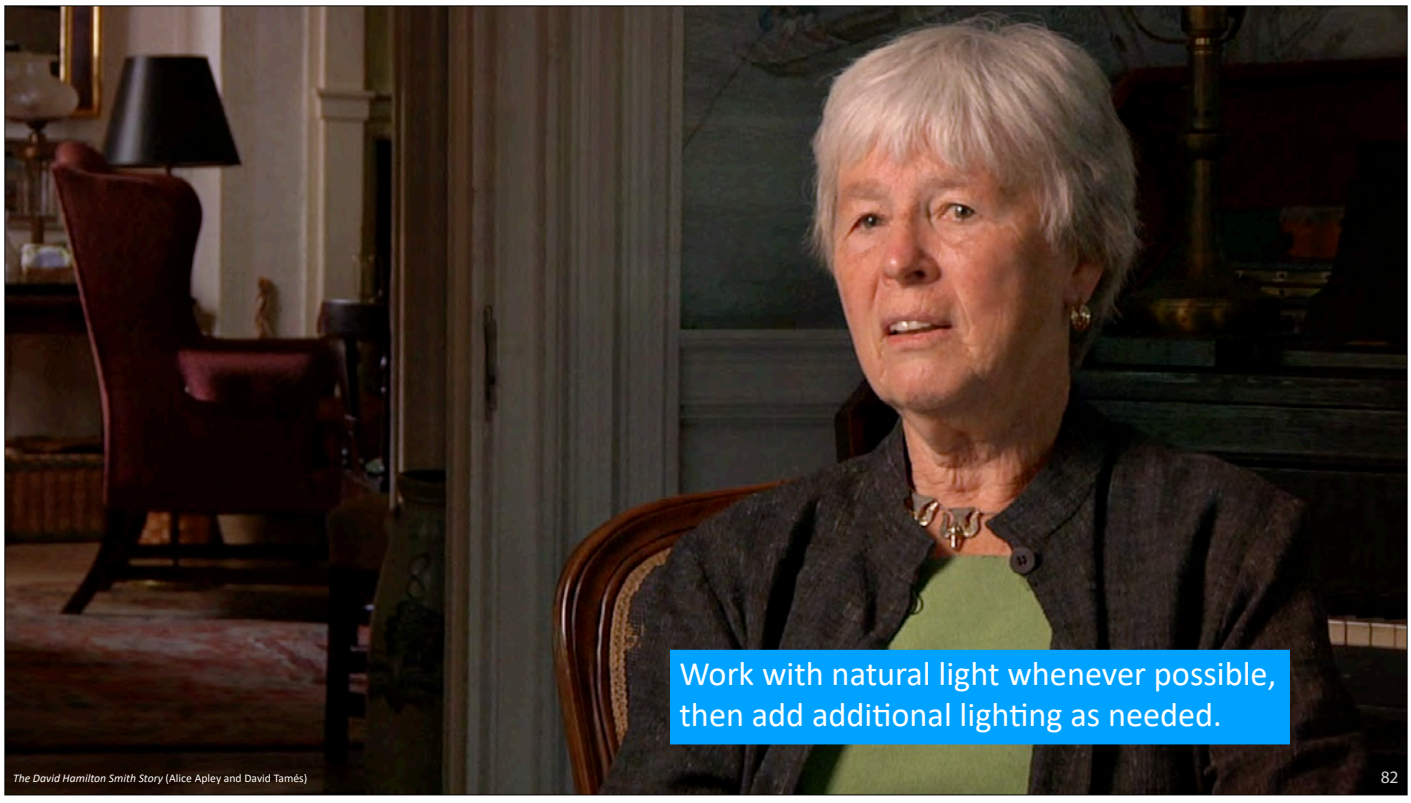

Often, just a single lighting instrument properly placed can make the difference between a dynamic, engaging image and a flat, lifeless image.
Latitude Zero: Ecuador and the Galapagos Dialogue of Civilizations, Summer II 2016


SONY
In most situations, especially sunlit exterior scenes with people, favor the fill side of the face.
Latitude Zero: Ecuador and the Galapagos Dialogue of Civilizations, Summer II 2016


When shooing outdoors on a sunny day, if you don't have a flex-fill or appropriate lighting instruments, find a location that offers lighting suitable for your creative goals.
Latitude Zero: Ecuador and the Galapagos Dialogue of Civilizations, Summer II 2016

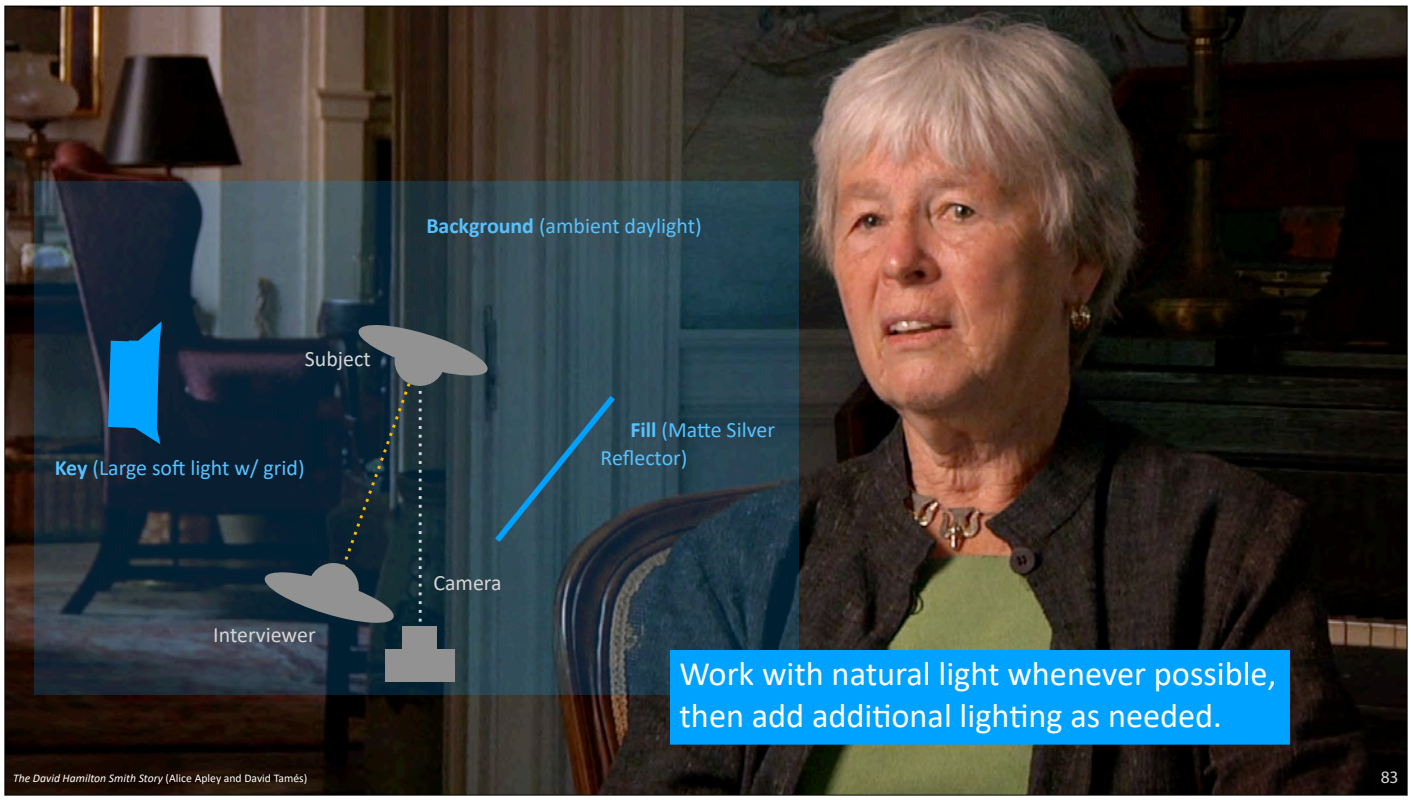
Portable, battery-powered LED lights are easy to travel with and can make a huge difference in your overall production values.

Latitude Zero: Ecuador and the Galapagos Dialogue of Civilizations, Summer II 2016



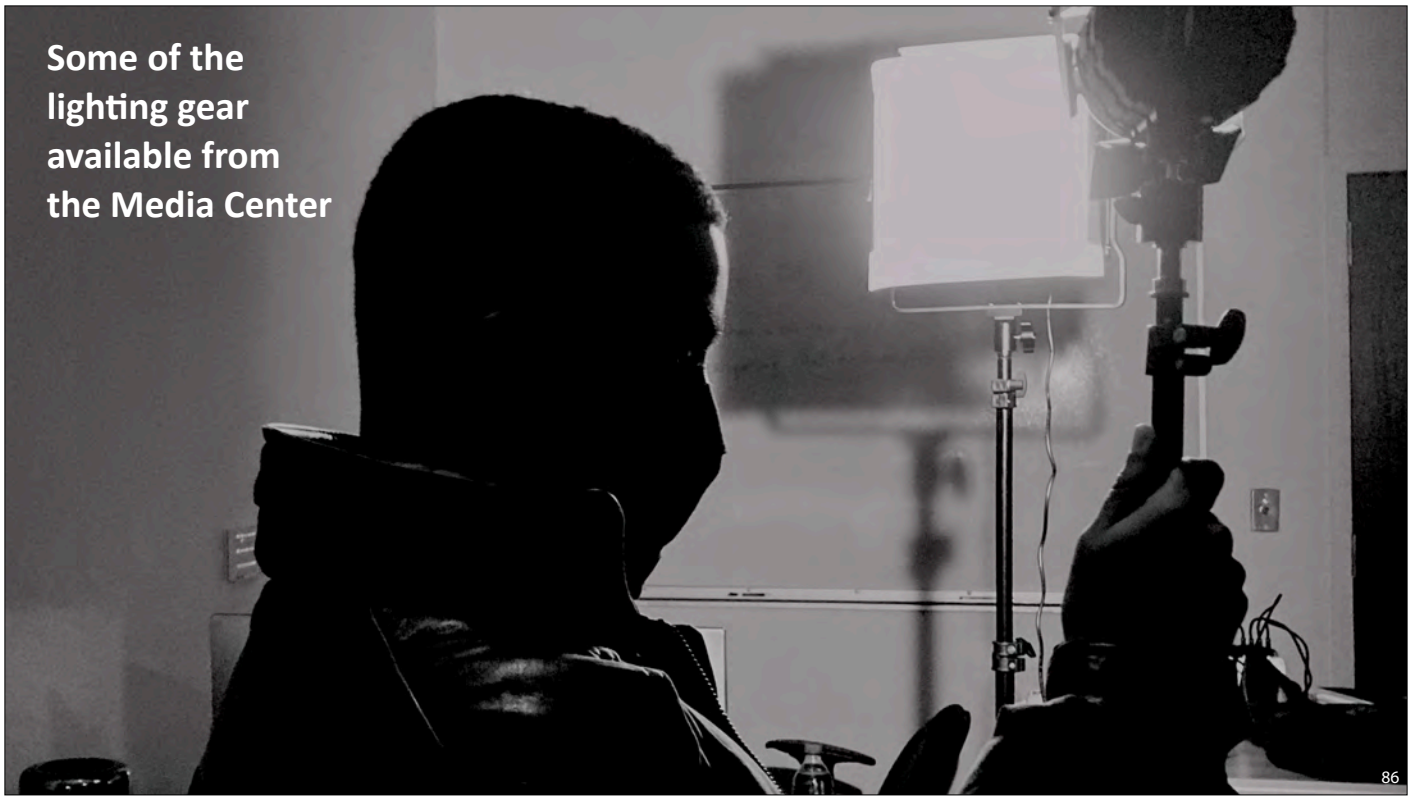
Work with natural light whenever possible, then add additional lighting as needed.

The David Hamilton Smith Story (Alice Apley and David Tamés)


Background (ambient daylight)
Subject
Key (Large soft light w/ grid)
Fill (Matte Silver Reflector)
Camera
Interviewer
Work with natural light whenever possible, then add additional lighting as needed.
The David Hamilton Smith Story (Alice Apley and David Tamés)
83


Daylight balanced units come in handy for exterior fill.
The David Hamilton Smith Story (Alice Apley and David Tamés)


Background (ambient daylight)
Subject (in shade of house)
Key (Daylight Balanced Soft Light)
Fill (Matte Silver Reflector)
Interviewer
Camera
Daylight balanced units come in handy for exterior fill.
The David Hamilton Smith Story (Alice Apley and David Tamés)


Some of the lighting gear available from the Media Center
86

1. Soft source

Intellytech Pocket-LiteCloth (foldable bi-color LED panel, broad source)

Softbox for Pocket-LiteCloth (layer of diffusion softens the light and evens out the beam; 45°grid reduces spill)

2. Hard (Fresnel-like) source

Intellytech Pocket Cannon Mini (LED 5600K hard light, available in 2 or 3-unit kits)

3. Small soft source

Apurture MC (travel kit with four small RGBWW LED panels)

…and a variety of light stands and mounting accessories

Intellytech Pocket-LiteCloth foldable bi-color LED panel

Good for use as a key, fill, or background light

Includes batteries, chargers, AC adapters, and mounting accessories

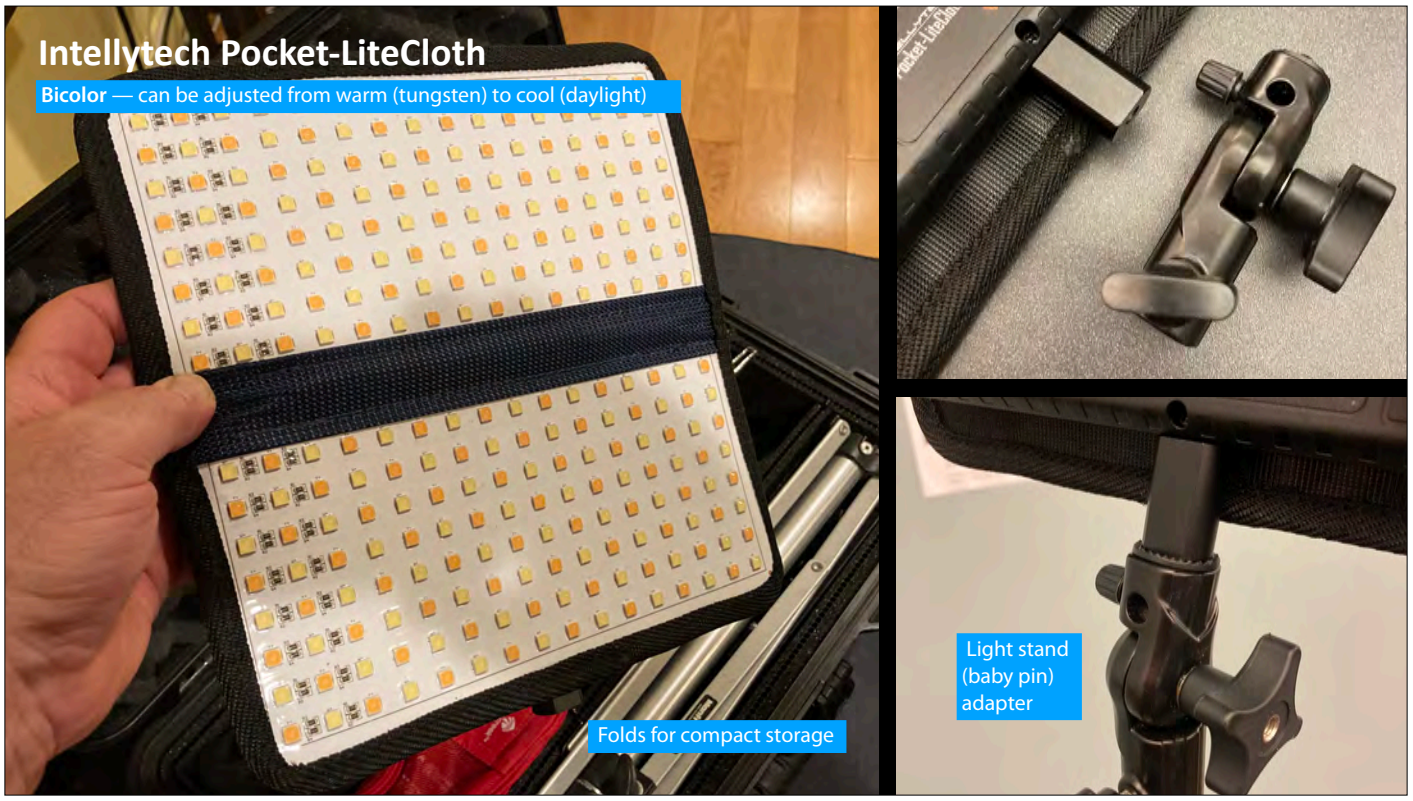
1/4-20 stud to accessory shoe adapter

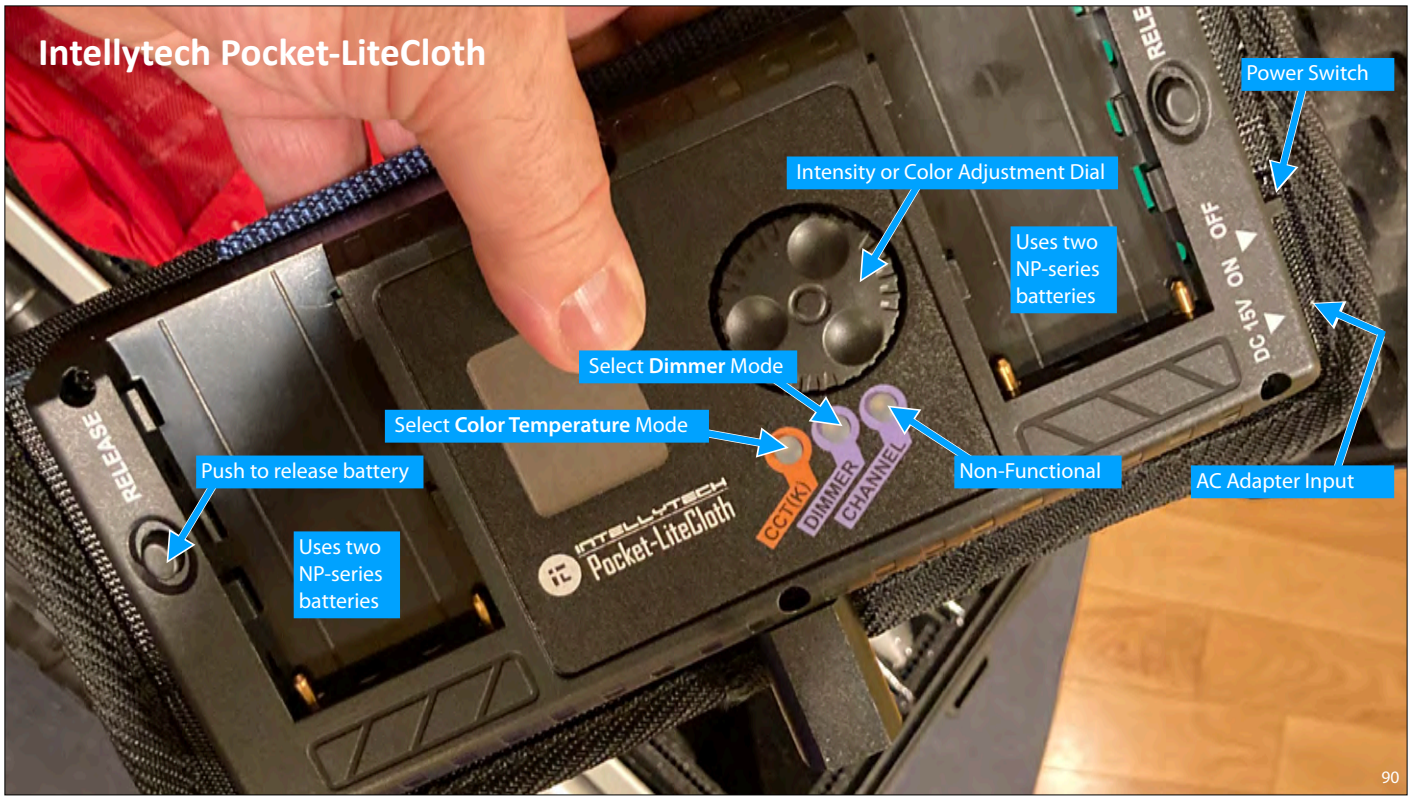
1/4-20 stud to 5/8 in. receiver adapter

For soft, diffused illumination, attach the **half lantern**

For directional, soft illumination, attach the **soft box**; to reduce spill even more, attach the **45°grid**

Powered by two NP (L-Series) batteries or AC adapter

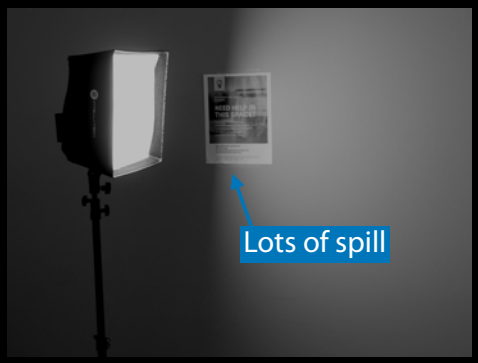

Intellytech Pocket-LiteCloth
Bicolor — can be adjusted from warm (tungsten) to cool (daylight)
Folds for compact storage
Light stand (baby pin) adapter


Intellytech Pocket-LiteCloth
Power Switch
Intensity or Color Adjustment Dial
Uses two NP-series batteries
Select Dimmer Mode
Select Color Temperature Mode
Push to release battery
Non-Functional
AC Adapter Input
Uses two NP-series batteries
RELEASE
OFF
ON
DC 16V
CCT(K)
DIMMER
CHANNEL
Pocket-LiteCloth

Intellytech Pocket-LiteCloth with Softbox and 45˚ Grid

Intellytech Pocket-LiteCloth with Softbox and 45˚ Grid

panel alone
provides a broad, somewhat harsh beam



panel with soft box
provides a wide, soft beam

panel with soft box + 45˚ grid
reduces spill, providing a narrower soft beam

Intellytech Pocket Cannon Mini Kits

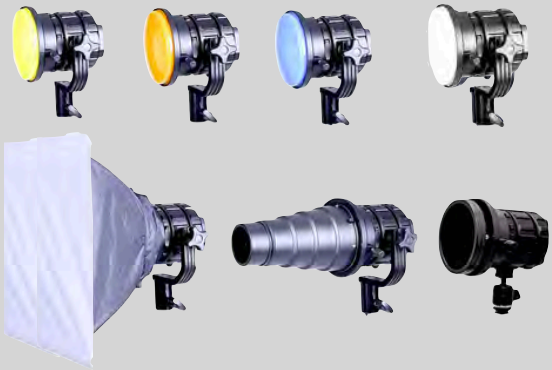
A 5600K hard light good for use as a back, kicker, accent, or background light

Sports barn-doors for spill control and includes accessories for mounting on a 1/4-20 stud or cold-shoe mount or on a light stand with a 5/8 inch pin

Available as a 2 or 3 unit kits with accessories, batteries, chargers, and AC adapters in a compact case.

Add color diffuser to soften the illumination and change color of the source

Add diffuser to soften the illumination



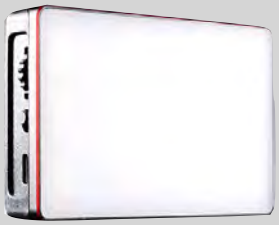
Add soft box to transform into a larger, softer source

Add snoot for use as an accent light on a specific area of the scene

Add grid to reduce spread

Aputure MC (travel kit with four small RGBWW LED panels)

Good for use as as a fill or accent light, special effect light, or for tabletop work



Approximately 2 hours battery life

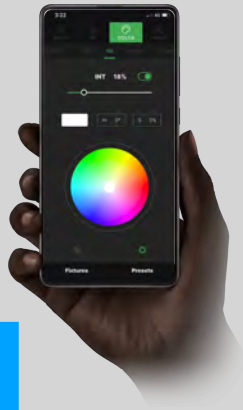
9.3 fc / 100 lux at 3.28' / 1 m

CRI rating of 96

Modes: HSI; CCT (3200 to 6500K in 100° increments); and FX

RGBWW— can be adjusted to any colors and in addition to R, G, B LEDs, has warm white and cool white LEDs for more accurate color rendition and higher intensity than a RGB panel.

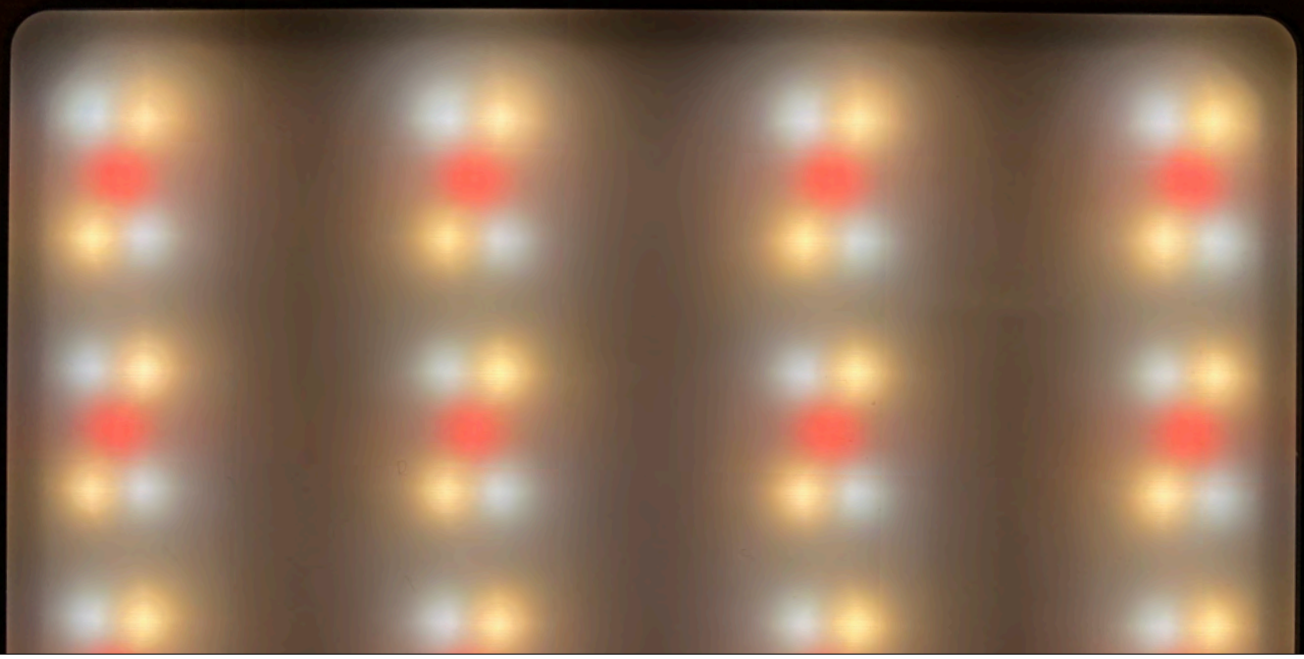
Units may be controlled using the Sidus Link mobile app



Each unit has a 1/4-20 socket for mounting; make sure to check out light stands or other grip gear to position these units where you want them

Aputure MC

RGBWW LED configuration



Aputure MC

These instructions are included in the handout provided to each team.

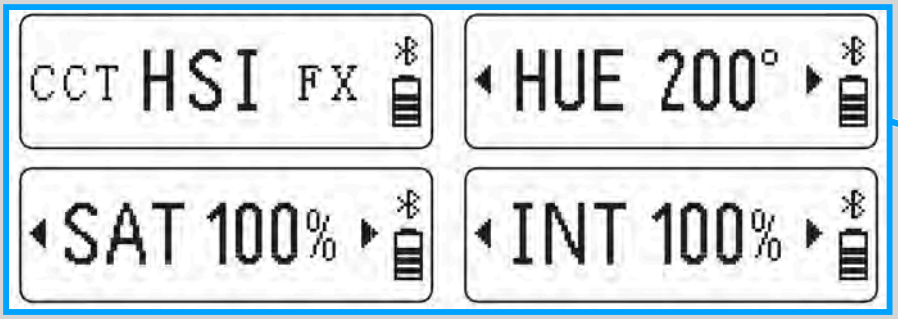
CCT Mode - dial in color temperature and intensity

Press and hold the control wheel for 2 seconds to access the system menu. Rotate the control wheel to select CCT and press the wheel to enter CCT mode. In CCT Mode, rotate the control wheel to adjust the color temperature between 3200-6500K. "Short press" the wheel to select intensity (INT) control, and turn the wheel to adjust the brightness level from 0-100%.

Aputure MC

These instructions are included in the handout provided to each team.

HSI Mode - dial in hue, saturation, and intensity (a.k.a. brightness)



Press and hold the control wheel for 2 seconds to access the system menu. Rotate the control wheel to select HSI and press the wheel to enter HSI mode. In HSI Mode, "short press" the control wheel to toggle between HUE/SAT (saturation)/INT (intensity) controls. When controlling HUE, rotate the control wheel to adjust the hue color from 0-360°. When controlling saturation (SAT), turn the control wheel to adjust the color saturation between 0-100%. When controlling intensity (INT), turn the wheel to adjust the brightness level between 0-100%.

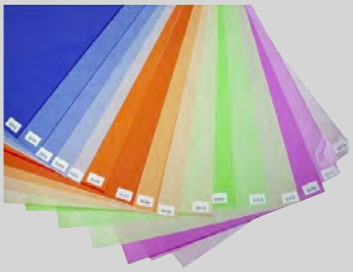
Essential Lighting Accessories

(Note: only light stands are currently available from the Media Center)

light stands

Gorillapods and other **small grip gear** can be used for attaching small panels to other objects

gel kits for matching color of sources or creative effects



gaffers tape has many uses including attaching small panels, taping down AC adapter cables and extension cords (avoid use of duct tape due to residue issues)

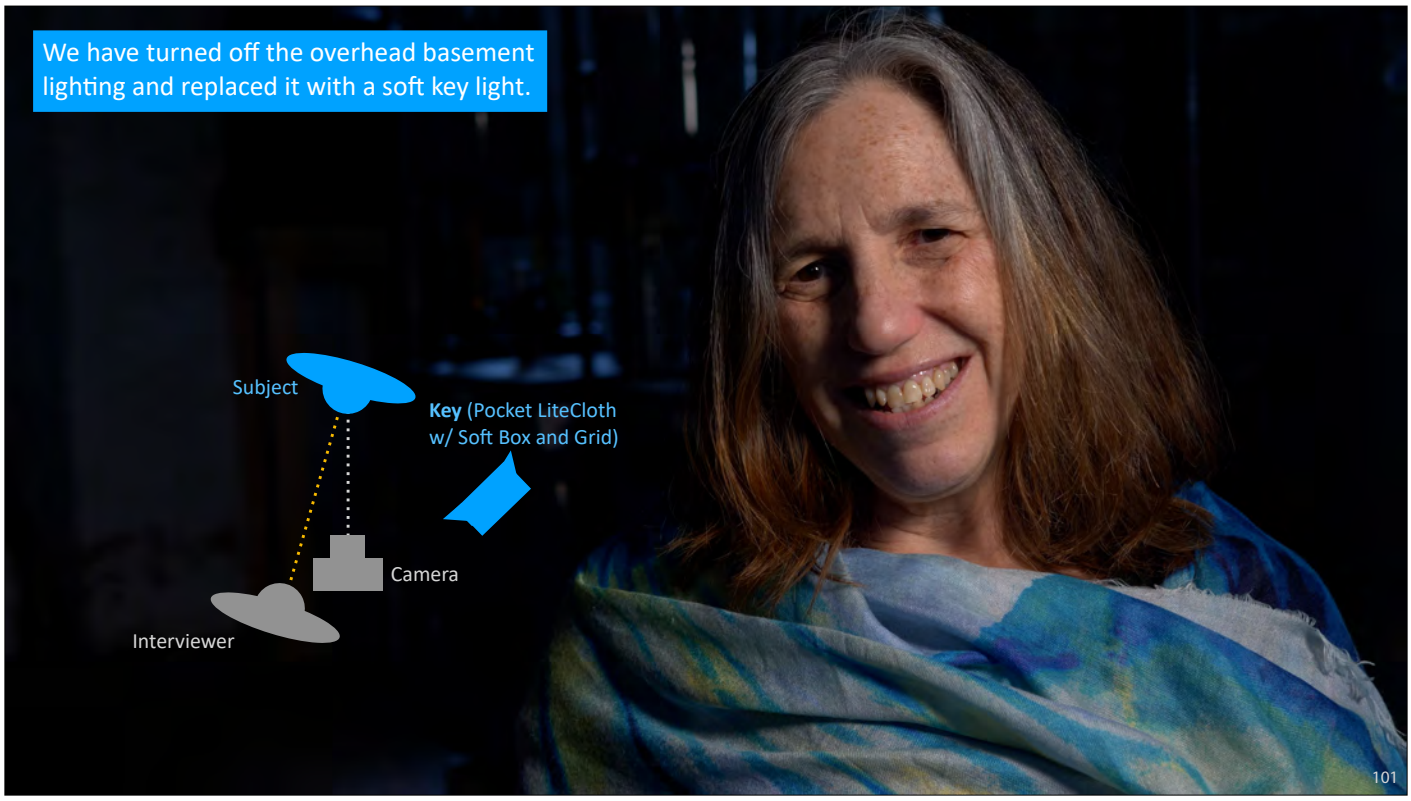
Quick and dirty lighting demo* [classic “three-point lighting” setup]

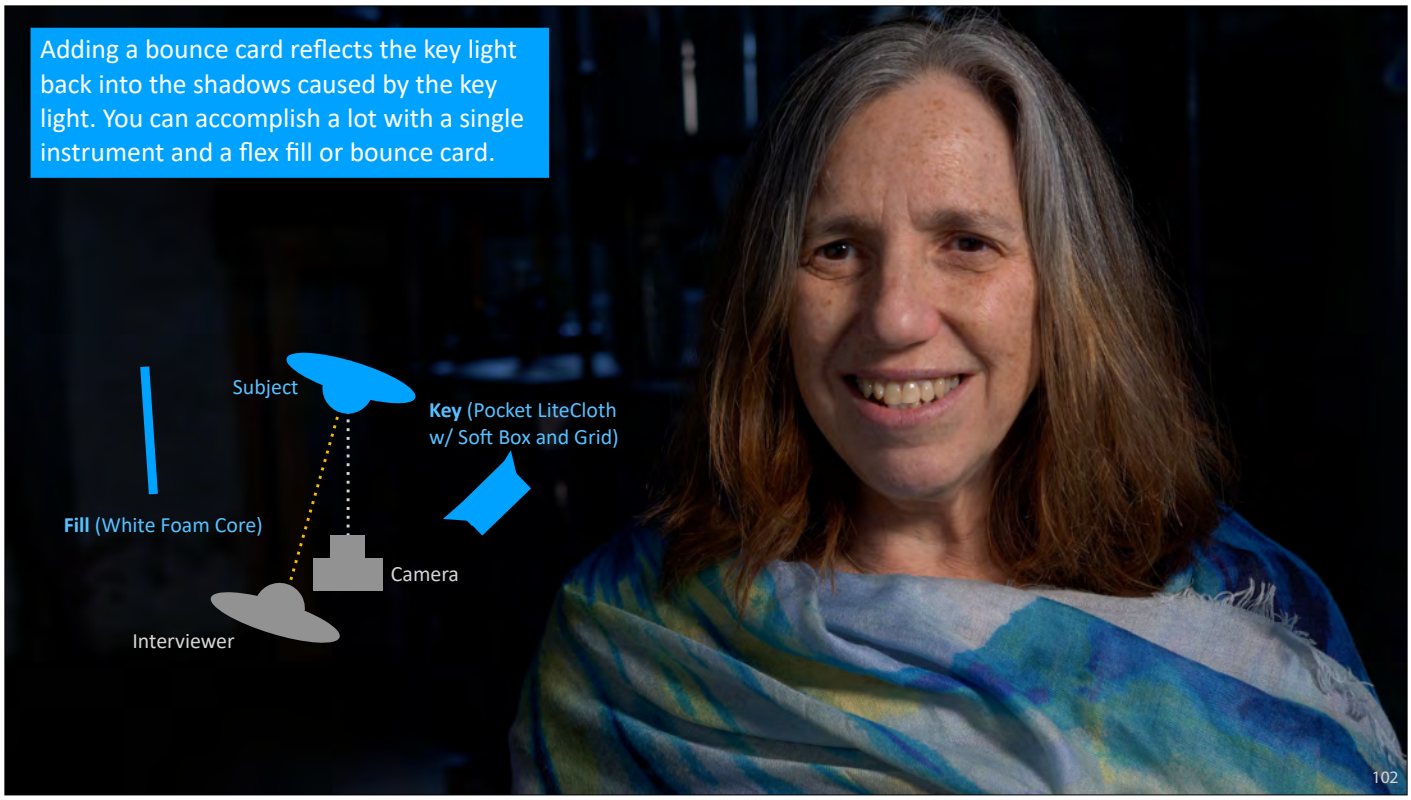
Gear used

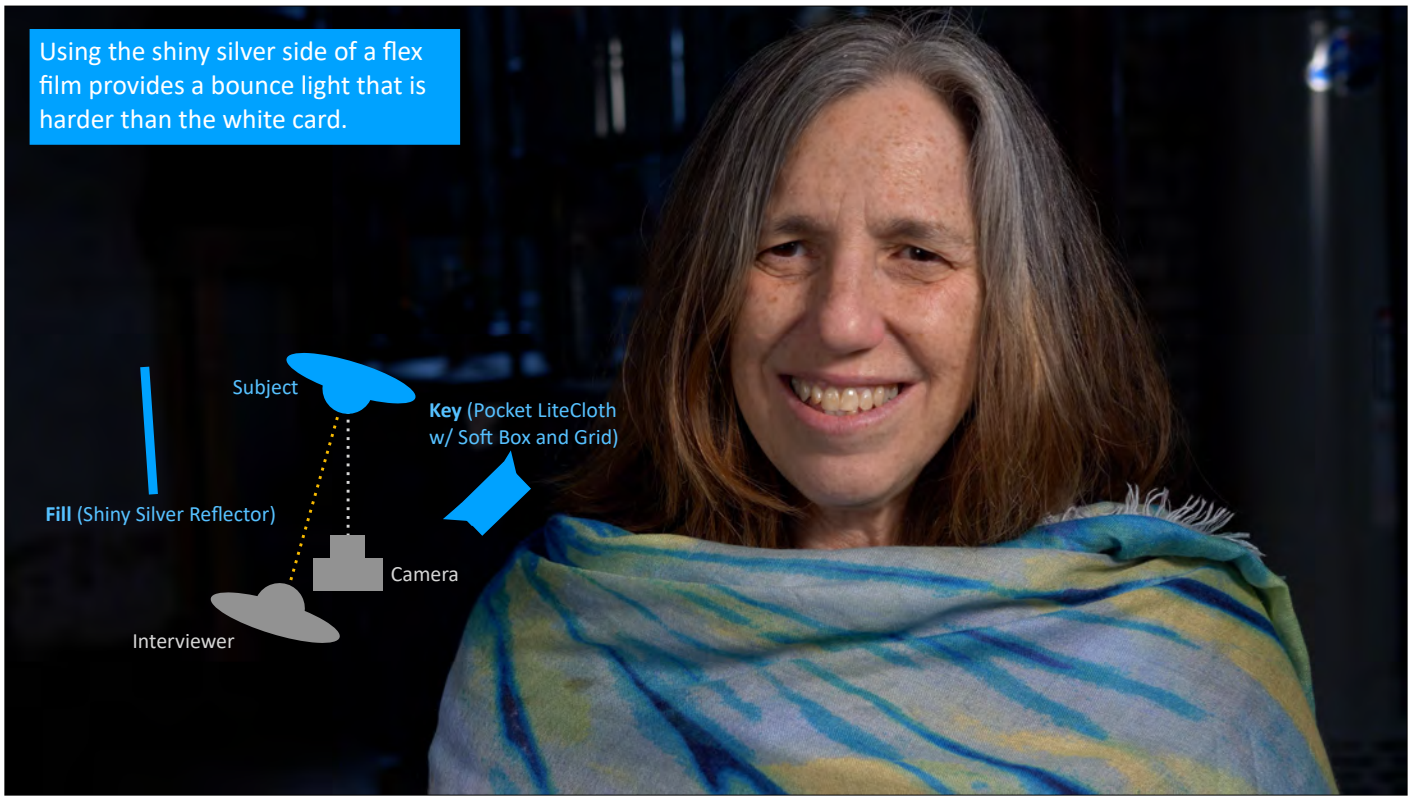
1. **Intellytech Pocket LiteCloth** w/ Softbox and Grid (LED bicolor panel)
2. A second **Intellytech Pocket LiteCloth** (LED bicolor panel)
3. Two **Intellytech Mini Pocket Cannons** (Fresnel, daylight** balanced)
4. **White Foam Core**
5. **Shiny Silver Reflector**

* Still frames from video without correction shot with Panasonic GH5, Panasonic 25mm f/1.4 lens @ 2.8, white balance preset 3200K, CineD profile, exposure set with white card at 90

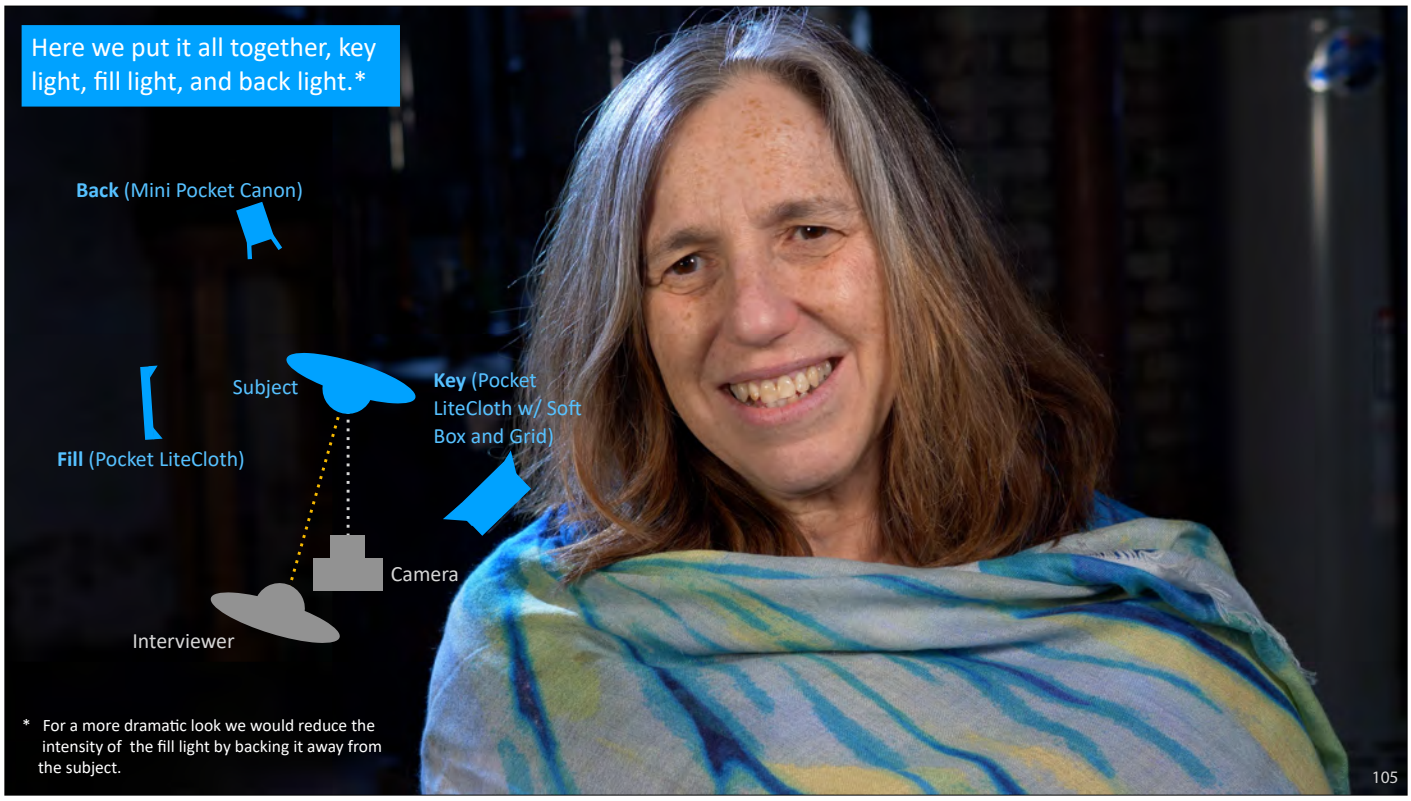
** These units are also available in a Tungsten balanced model; the Mini Pocket Cannon is equivalent to an Arri 150W Fresnel quartz-halogen unit, its big brother, the Pocket Cannon, is equivalent to an Arri 300W Fresnel quartz-halogen unit.

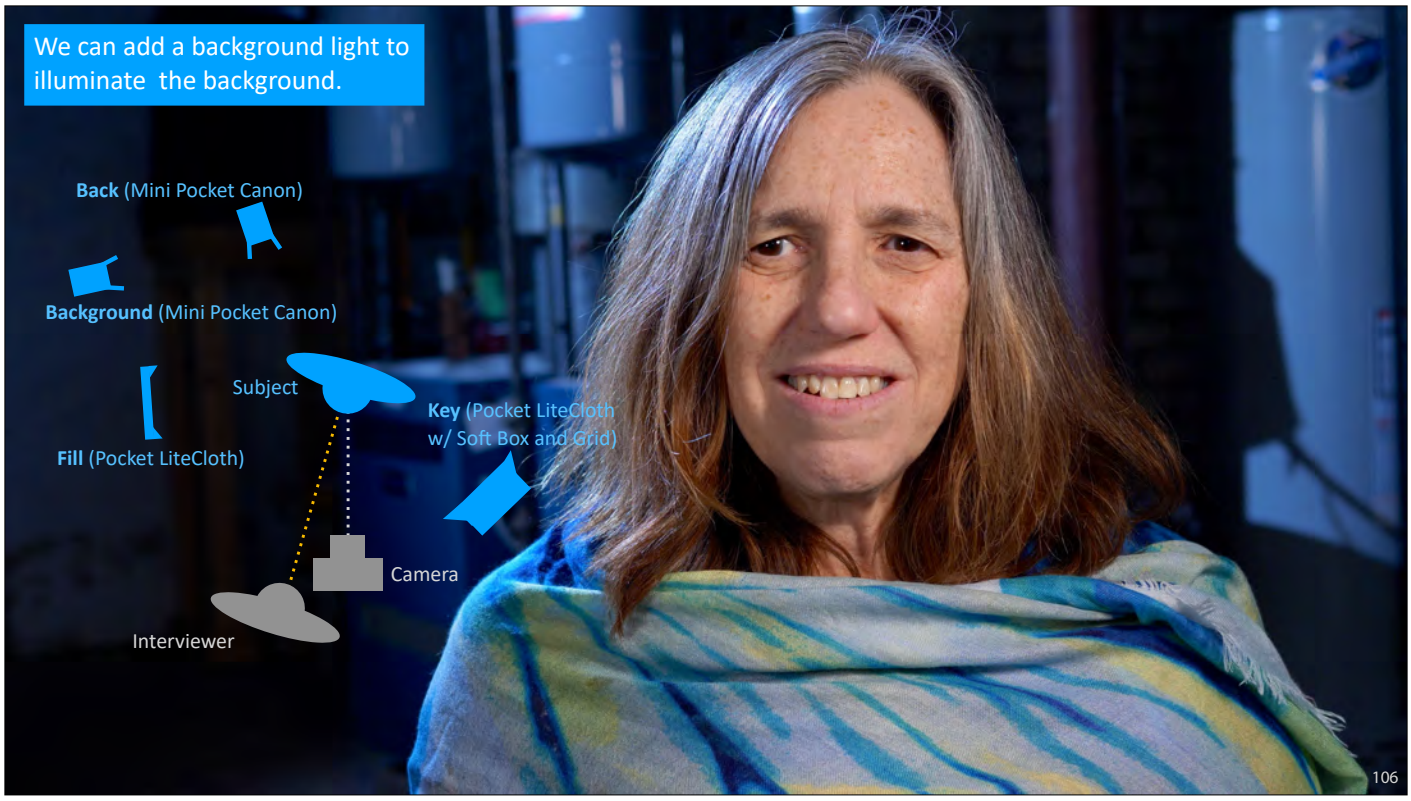

We have turned off the overhead basement lighting and replaced it with a soft key light.
Subject
Key (Pocket LiteCloth w/ Soft Box and Grid)
Camera
Interviewer
101


Adding a bounce card reflects the key light back into the shadows caused by the key light. You can accomplish a lot with a single instrument and a flex fill or bounce card.
Subject
Key (Pocket LiteCloth w/ Soft Box and Grid)
Fill (White Foam Core)
Camera
Interviewer
102


Using the shiny silver side of a flex film provides a bounce light that is harder than the white card.
Subject
Key (Pocket LiteCloth w/ Soft Box and Grid)
Fill (Shiny Silver Reflector)
Camera
Interviewer

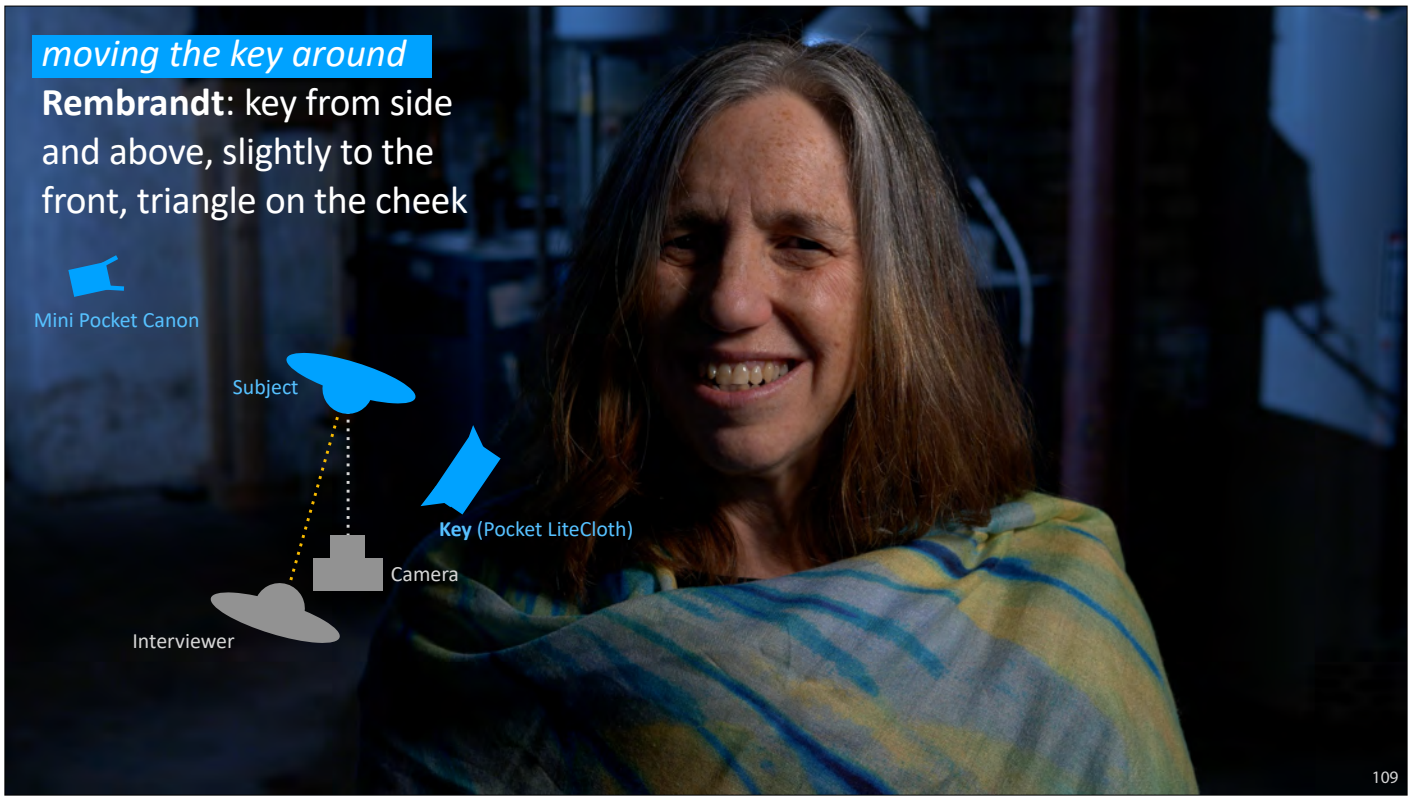

We can add a backlight for better separation between subject and background.
Back (Mini Pocket Canon)
Subject
Camera
Interviewer

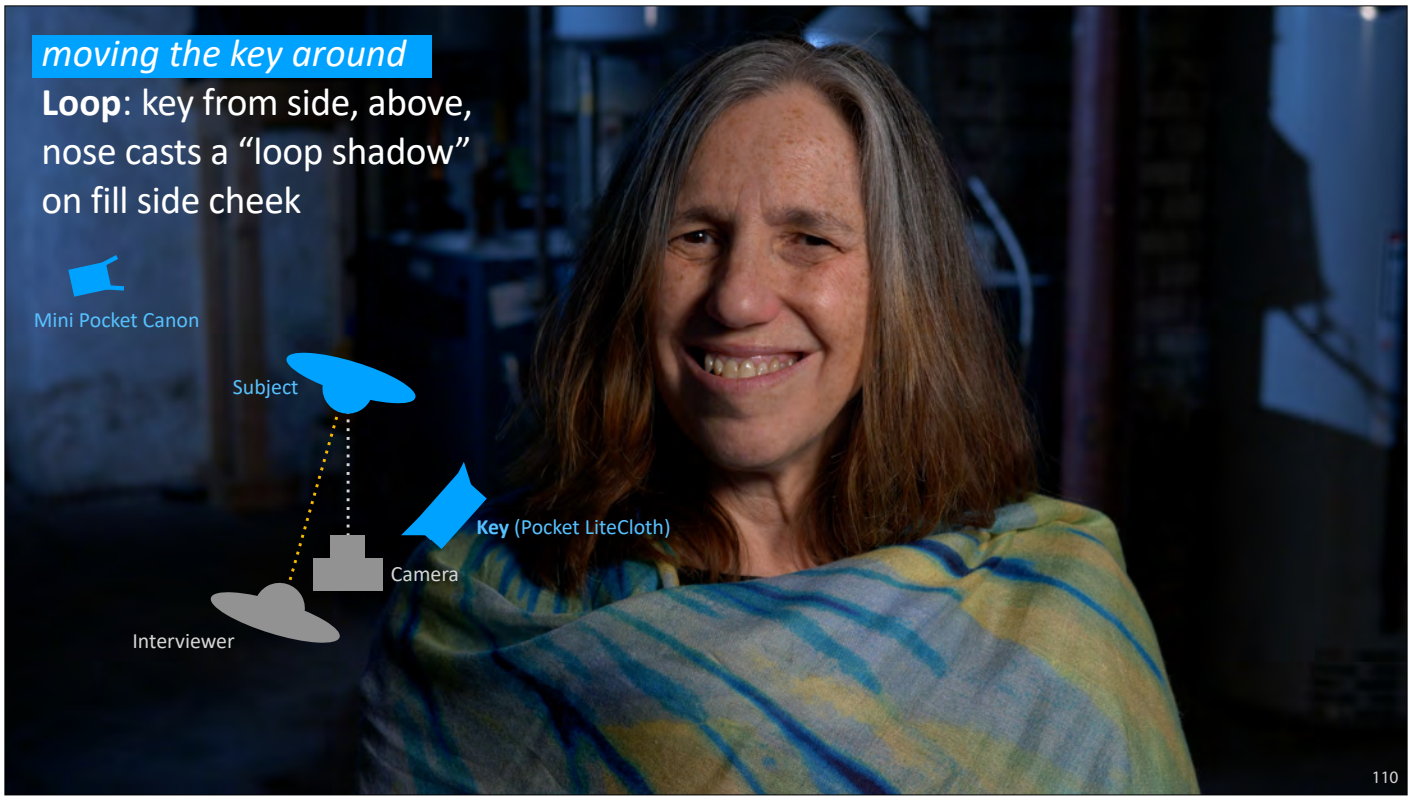

Here we put it all together, key light, fill light, and back light.*
Back (Mini Pocket Canon)
Subject
Key (Pocket LiteCloth w/ Soft Box and Grid)
Fill (Pocket LiteCloth)
Camera
Interviewer
* For a more dramatic look we would reduce the intensity of the fill light by backing it away from the subject.
105


We can add a background light to illuminate the background.
Back (Mini Pocket Canon)
Background (Mini Pocket Canon)
Subject
Key (Pocket LiteCloth w/ Soft Box and Grid)
Fill (Pocket LiteCloth)
Camera
Interviewer
106


moving the key around
backlighting: key light source from the back of the subject
Mini Pocket Canon
Subject
Key (Pocket LiteCloth)
Camera
Interviewer
107

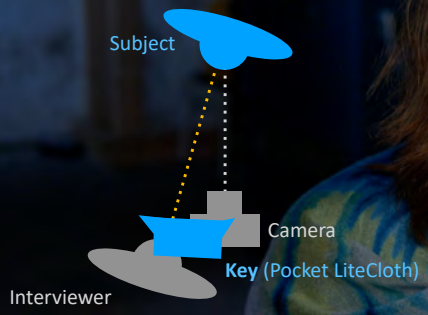

moving the key around
Split lighting: key from the side of the subject
Mini Pocket Canon
Subject
Key (Pocket LiteCloth)
Camera
Interviewer
108


moving the key around
Rembrandt: key from side and above, slightly to the front, triangle on the cheek
Mini Pocket Canon
Subject
Key (Pocket LiteCloth)
Camera
Interviewer
109


moving the key around
Loop: key from side, above, nose casts a “loop shadow” on fill side cheek
Mini Pocket Canon
Subject
Key (Pocket LiteCloth)
Camera
Interviewer
110

moving the key around

Hollywood a.k.a. glamour: key from above the camera position, butterfly shadow under nose*

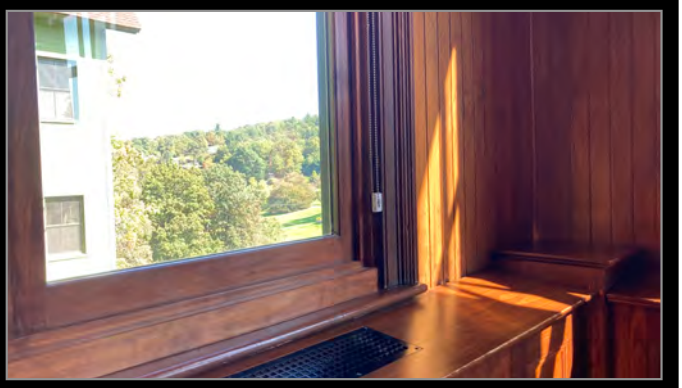


*requires some fill to reduce shadow areas along with with an eye light for the full "Hollywood effect"

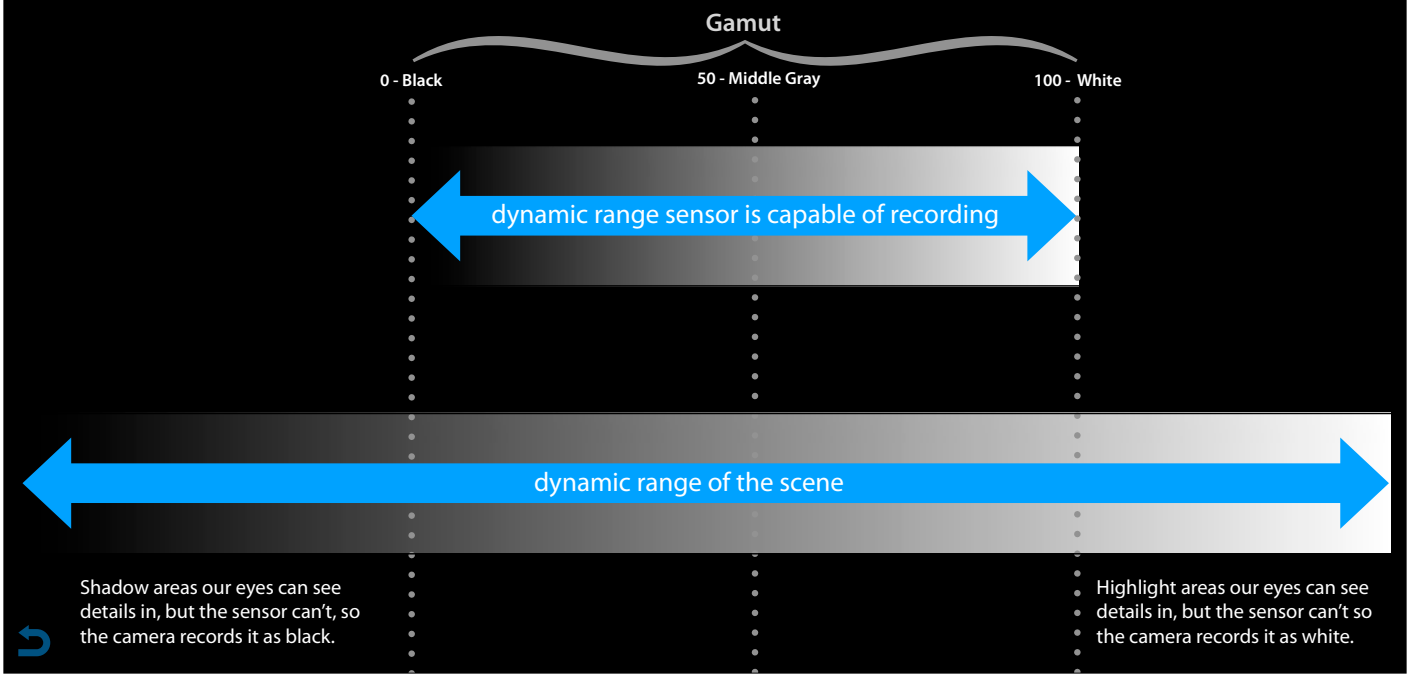
What is exposure?

exposing for the **exterior highlights**

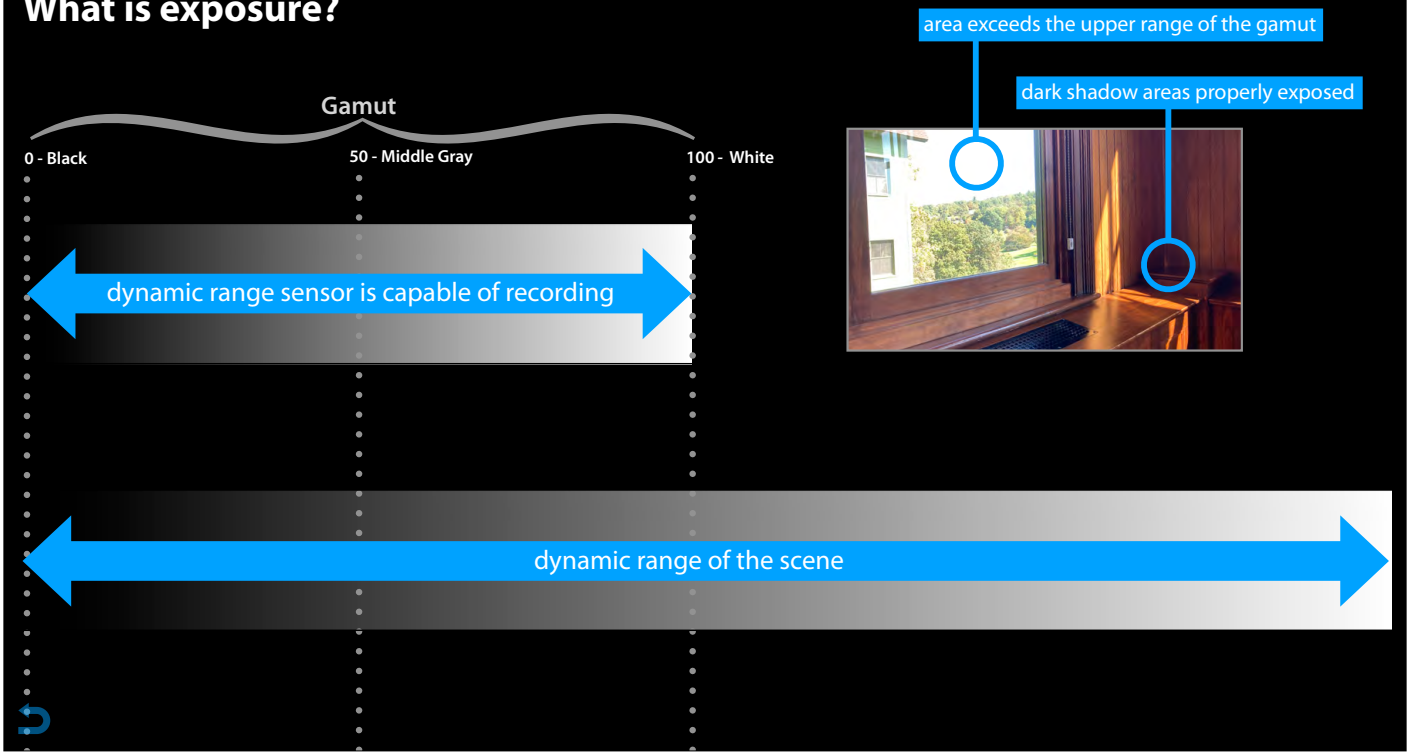
exposing for the **interior shadows**



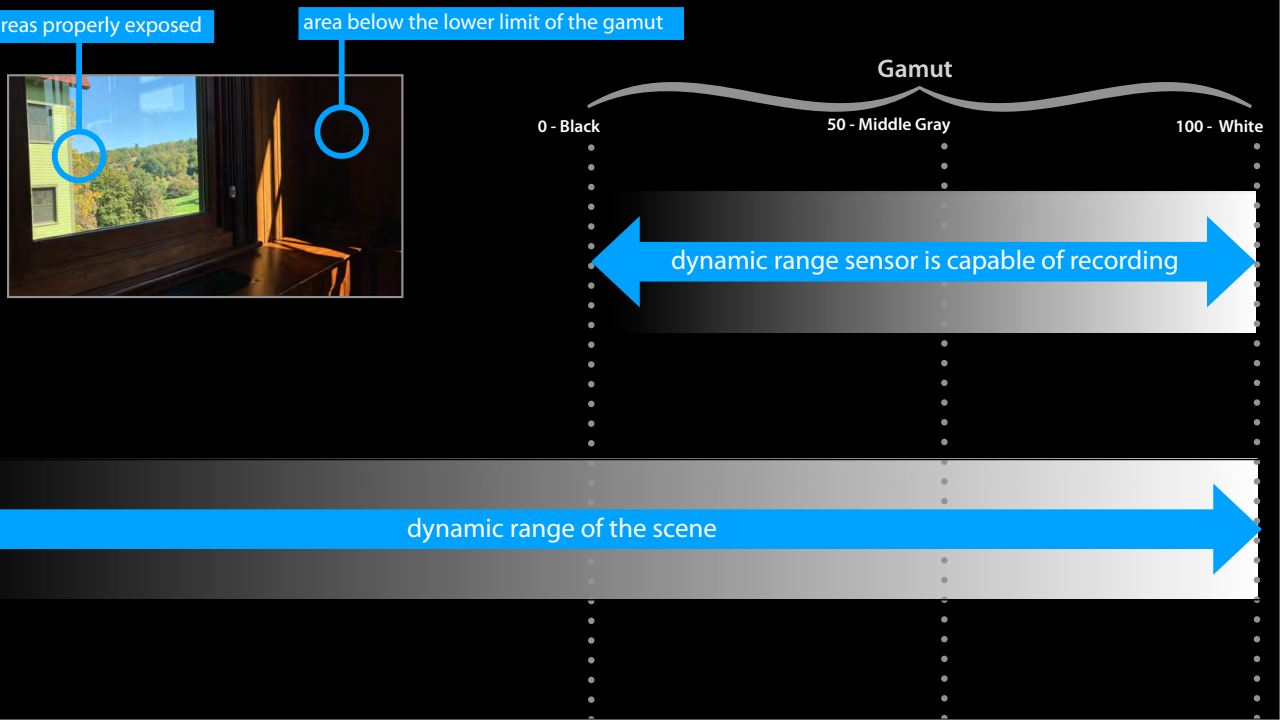
What is exposure?



What is exposure?



What is exposure?



Intensity

luminous flux
(unit: lumens)

the amount of visible light emitted by the lighting instrument

Illuminance
(unit: lux, metric or foot-candles, imperial)

the amount of visible light that falls on a specific surface per unit area

Image: Kal Visuals

How much illumination is needed for proper exposure?

Incident lighting in foot-candles

EI	f/1.4	f/2	f.2.8	f/4	f/5.6	f/8
200	13	25	50	100	200	400
400	6.4	13	25	50	100	200
800	3.2	6.4	13	25	50	100
1600	1.6	3.2	6.4	13	25	50
3200	0.8	1.6	3.2	6.4	13	25
6400	0.4	0.8	1.6	3.2	6.4	13

Frame rate 24p; Exposure: 1/48 (180° shutter);
1 foot-candle = 10.7639 lux

Incident lighting in lux

EI	f/1.4	f/2	f.2.8	f/4	f/5.6	f/8
200	140	280	560	1120	2240	4480
400	70	140	280	560	1120	2240
800	35	70	140	280	560	1120
1600	17.5	35	70	140	280	560
3200	8.75	17.5	35	70	140	280
6400	4.4	8.75	17.5	35	70	140

Frame rate 24p; Exposure: 1/48 (180° shutter);
1 lux = 0.092903 foot-candles

Data from The Set Lighting Technicians Handbook by Harry Box (Focal Press)

Illumination specifications of the lighting instruments we'll use in the workshop

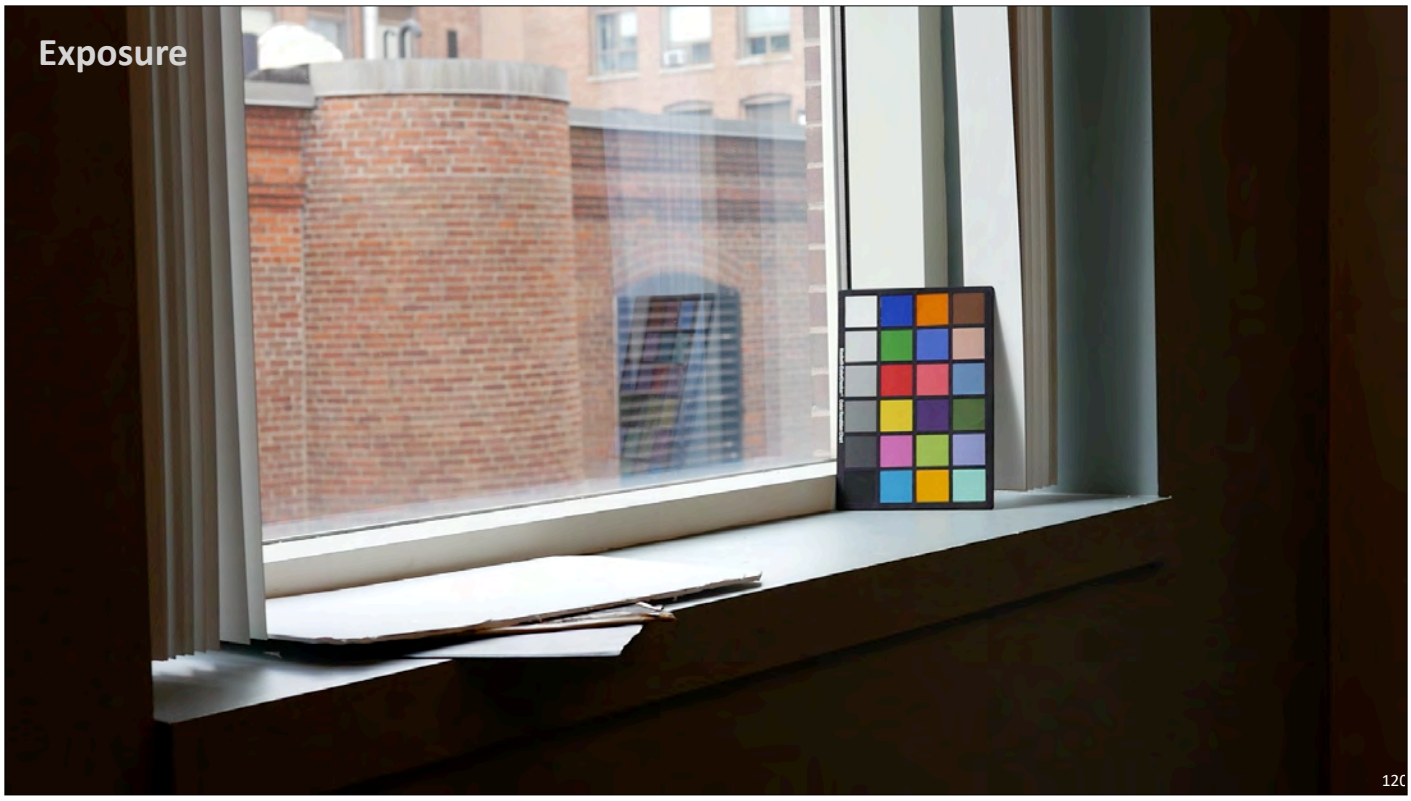
Unit	Power	Distance	Mixed Color Temperature	3,000 K	5,600 K	10,000 K
Intellytech Pocket Lite-Cloth (Bicolor)	40 W	3 feet	1,330 lux 124 FC	1,320 lux 127 FC		1,430 lux 133 FC
Intellytech Pocket Cannon Mini (Daylight)	15 W	1 meter			1,100 lux 102 FC	
		2 meter			290 lux 27 FC	
Apurture MC (RGBWW)	5W	0.3 meter	1,100 lux 102 FC			
		0.5 meter	400 lux 37 FC			
		1 meter	100 lux 9.3 FC			

Data collected from vendor web sites

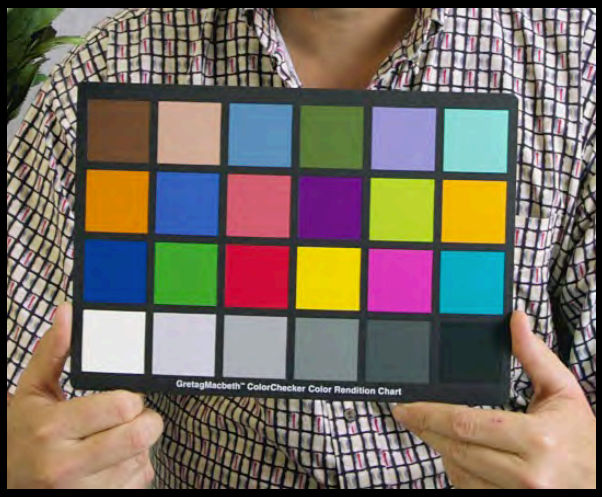
Illumination levels of existing lighting conditions

Source	lux	foot candles	Recommended Instruments	Instruments available from the CAMD Media Center that can help enhance existing lighting conditions
Bright Summer Day	100,000	9290	High Brightness HMI	None
Full Daylight	10,000	929	High Brightness HMI or High Brightness LED	None, but you can use the large diffusion disk in 5-in-one flex fill to soften direct sunlight or the matte white or shiny silver reflector to bounce light into shadow areas
Overcast Day	1,000	93	HMI or LED	**Litepanels Astra** Bi-Color LED Panel 3712 lux / 345 fc at 5'* **Intellytech Pocket Cannon Mini** COB LED (Daylight) 1,100 lux / 102 fc at 3'*
Traditional Office Lighting	300 – 500	28 – 47	LED	**Intellytech Pocket Lite-Cloth** Bicolor SMD LED 1,320 lux / 127 fc at 3'*
Home Interior Lighting	100 – 300	9.3 – 28	LED or low-wattage Quartz Halogen	**Aperture MC** RGBWW SMD LED 400 lux / 37 fc at 1.5' 100 lux / 9.3 fc at 3'
Twilight	10	0.93	LED or low-wattage Quartz Halogen	
Full Moon	< 1	< 0.1	LED	

* The addition of diffusion or the use of a soft box will reduce output significantly, limiting the viability of these units as fill lights or accent lights when mixing with natural daylight.
Source of illumination data: How to Measure Light Intensity by BIOS Lighting



What is good exposure?



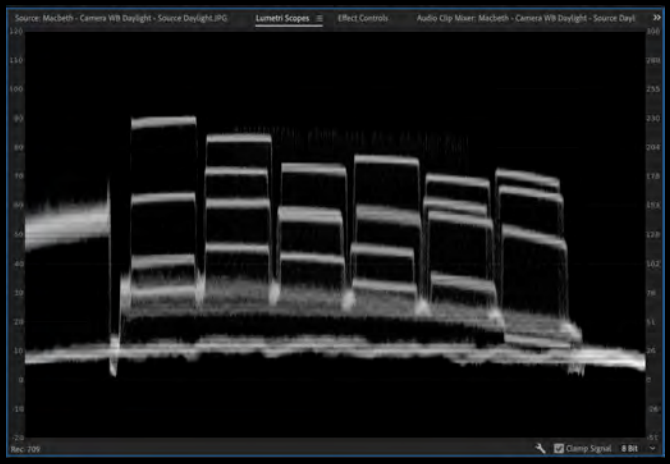
See also ColorChecker, https://en.wikipedia.org/wiki/ColorChecker
See Color Checker, Calibrite, https://calibrite.com/us/product/colorchecker-classic/

Software Support:

- Adobe Photoshop and Adobe Lightroom via a free plugin
- Black Magic Design DaVinci Resolve for color grading
- 3DLUT Creator
- and others

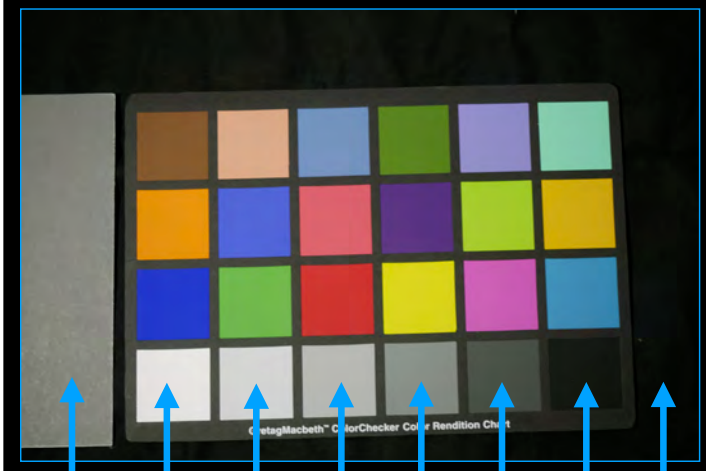
What is good exposure?

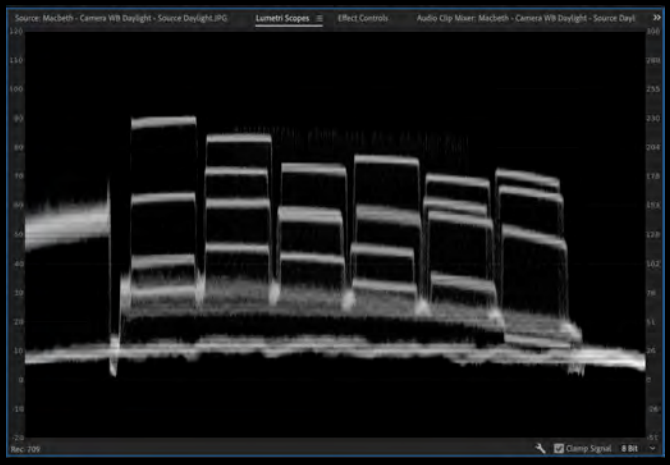
What is good exposure?



Waveform Monitor
shows luminance component of the video signal, may be found in external monitors and Lumetri Scopes in Premiere Pro

What is good exposure?





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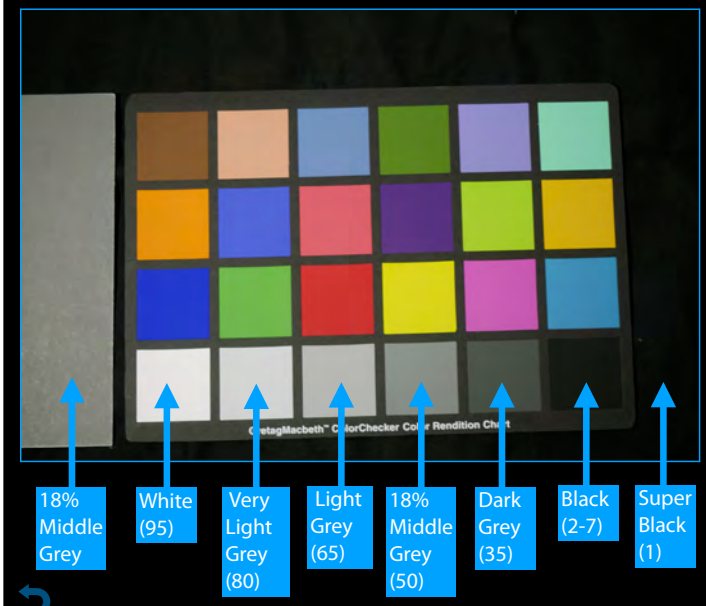
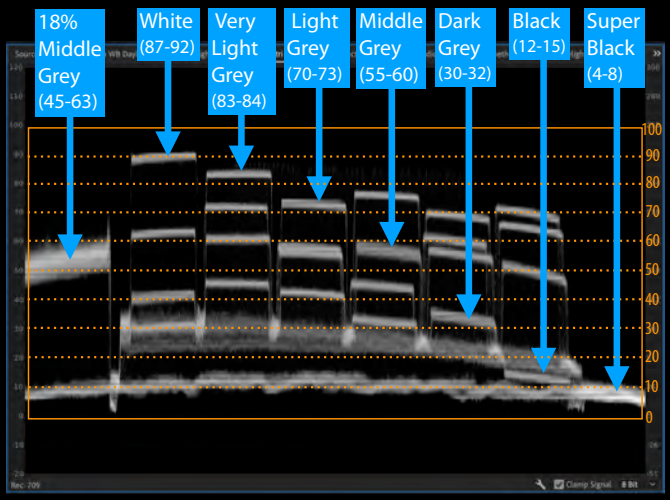


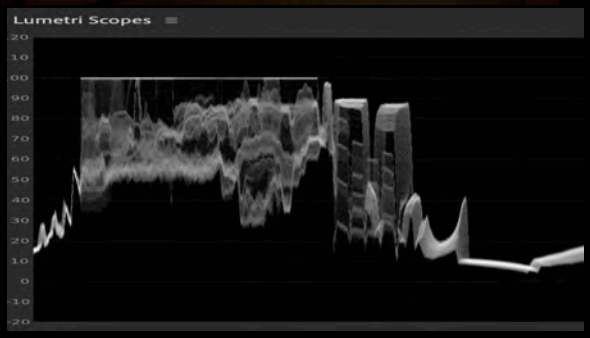


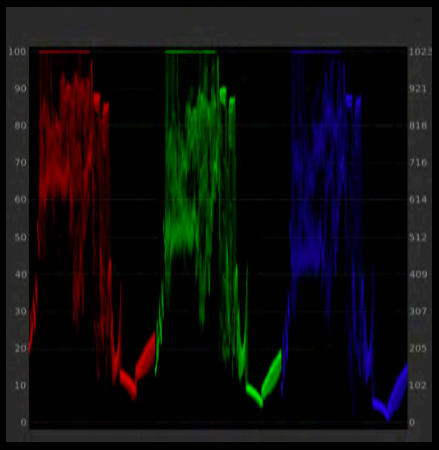
Waveform Monitor
shows luminance component of the video signal, may be found in external monitors and Lumetri Scopes in Premiere Pro

What is good exposure?

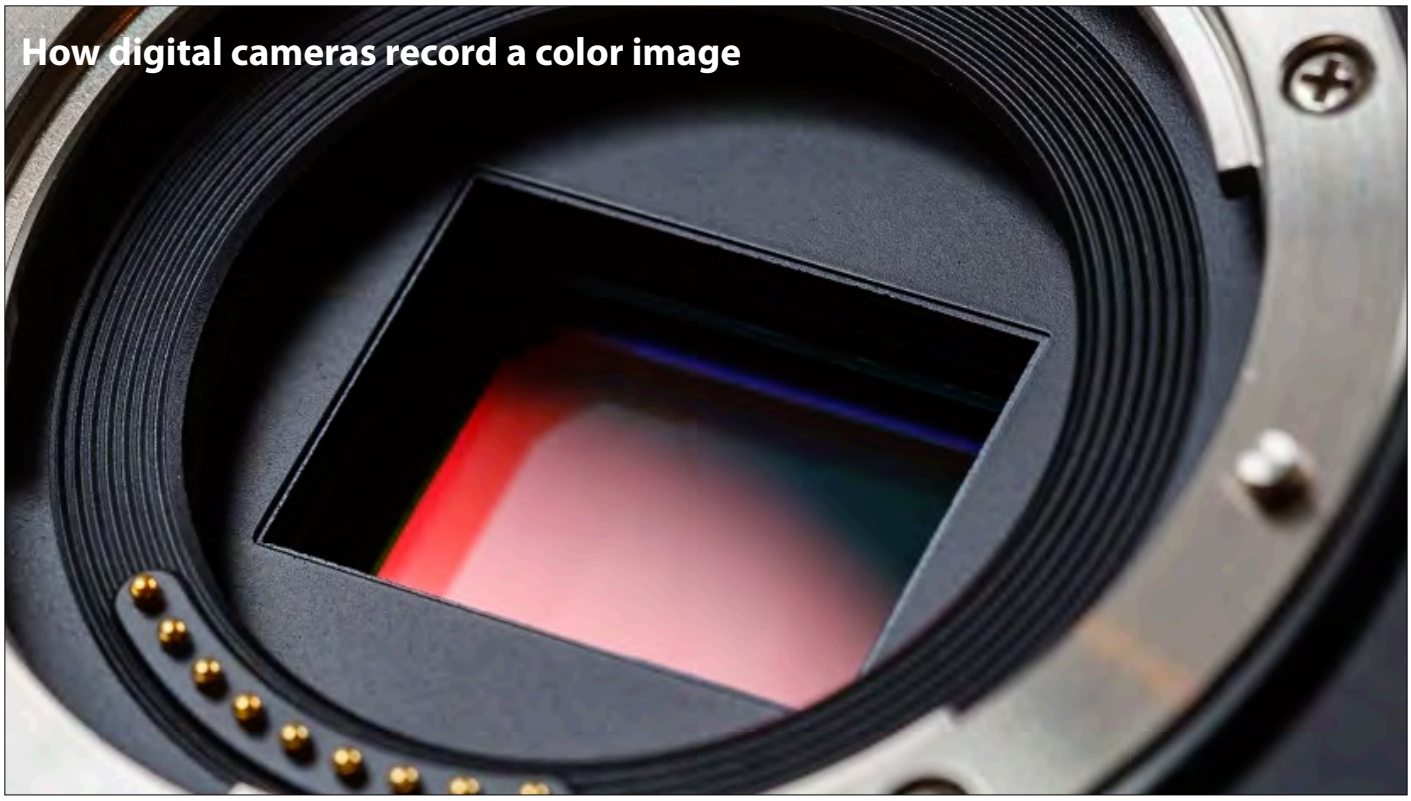
2 stops under | 1 stop under | about right | 1 stop over | 2 stops over

Recording accurate color

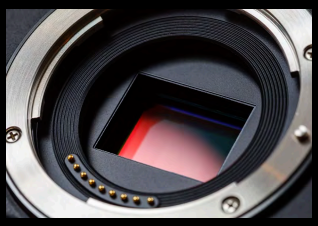


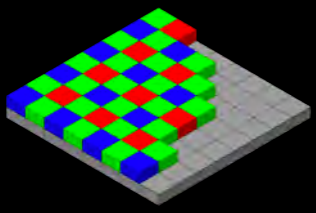


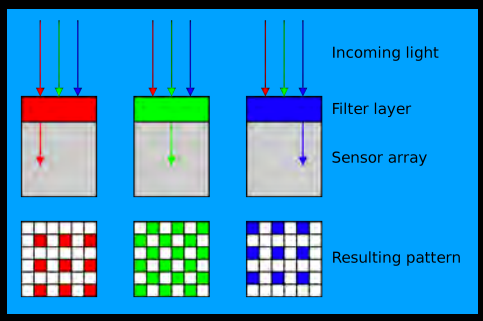
How digital cameras record a color image



How digital cameras record a color image







Original scene

camera **projects** image onto sensor (each pixel sensor has a color filter over it)

Bayer pattern image

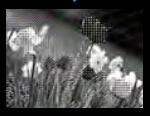


image is **color coded** with Bayer filter colors based on response of each pixel sensor

Color coded image with Bayer filter colors

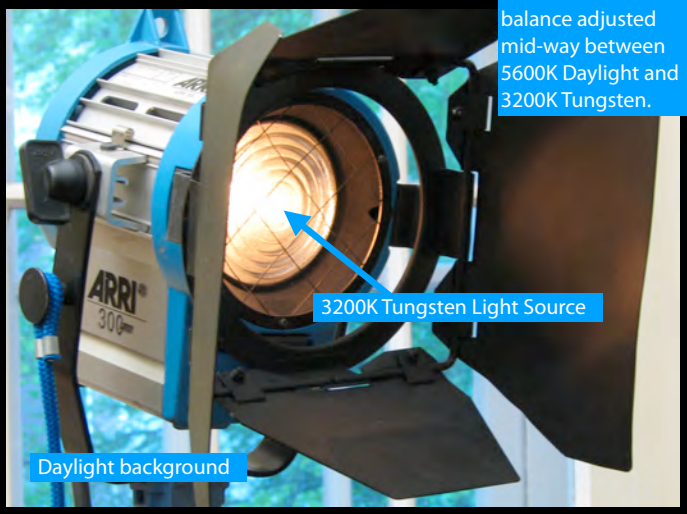
interpolation of missing color information reconstructs the original image

Final **RGB image**

Bayer patterns by Cburnett (CC BY-SA 3.0), https://en.wikipedia.org/wiki/Bayer_filter#/media/File:Bayer_pattern_on_sensor.svg and https://en.wikipedia.org/wiki/Bayer_filter#/media/File:Bayer_pattern_on_sensor_profile.svg
RGB image by Cmglee (CC BY-SA 3.0), https://commons.wikimedia.org/wiki/File:Colorful_spring_garden_Bayer.png

What is white balance?

The camera does not know what combination of red, green, and blue values should be rendered as white, so we need to "White Balance" the camera to tell it. This offers much better color rendering than auto white balance.



(PD)

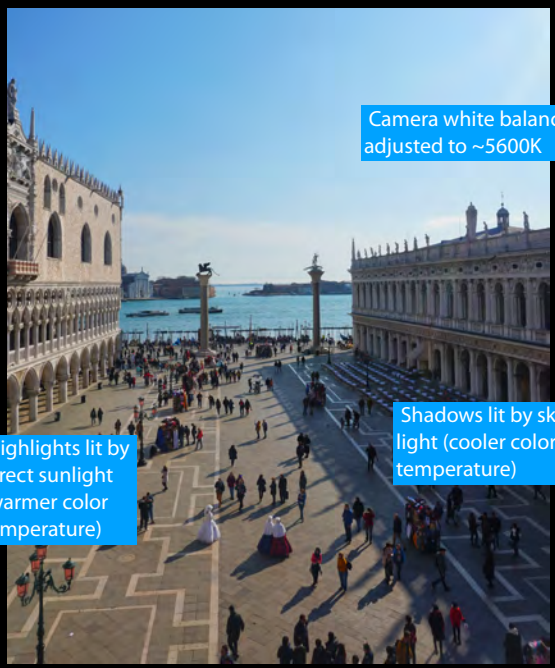
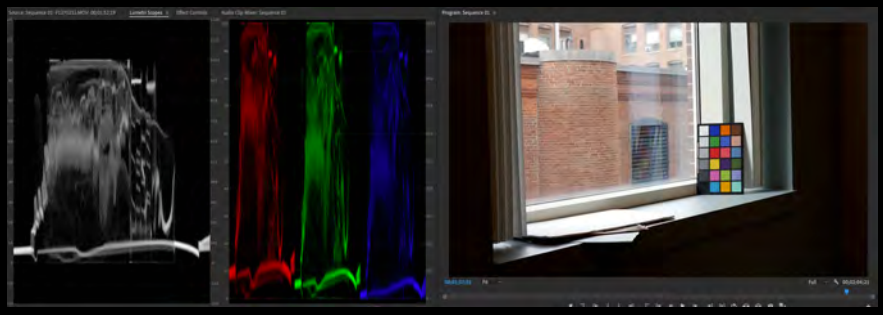
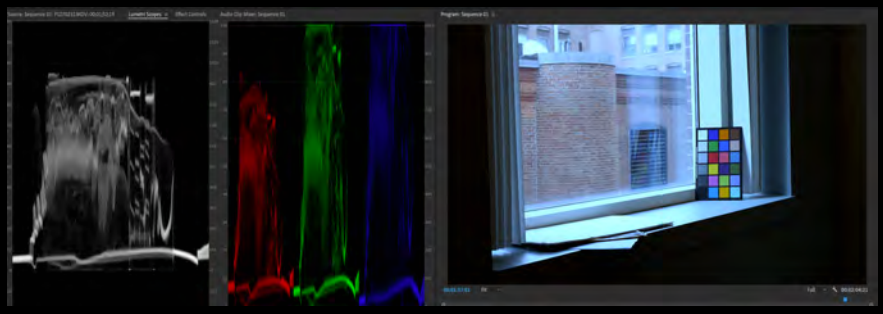


Photo by Keo Oran (CC0)

What is white balance?

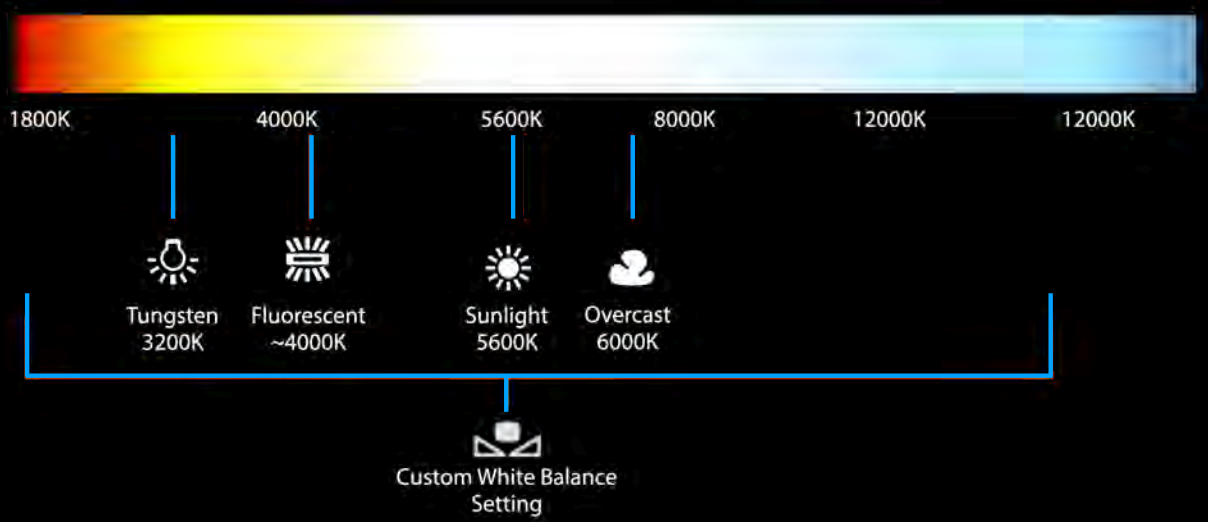


White Balance set manually using white card



White Balance set to 3200K (notice how daylight is seen by the camera)

White balance presets common to digital cameras



Modifying the quality and color of illumination sources

Diffusion

Spreads the beam, various types:

Tough Spun
White Diffusion
Frost

Also available: Grid Cloth, Tough Silk, Soft Diffusion

Modifying the quality and color of illumination sources

Diffusion frame or flex fill diffusion silk

Production for Covid 19: South Portland PSA (Munjoy Hill Media) by Tim Ouillette and David Tamés and students in ARTD 2380 Video Basics, Fall 2020.

Spreads the beam, various types:

- flex fill diffusion silk (available solo or 5-in-one combos)
- diffusion of your choice on a frame

Modifying the quality and color of illumination sources

Color correction gels

Image by Siddarth Siva

300W Quartz-Halogen Fresnel, 3200K

300W Quartz-Halogen Fresnel, 3200K with Full CTB

CTB
(Color Temperature Blue)

- Double CTB
- Full CTB
- 3/4 CTB
- 1/2 CTB
- 1/4 CTB
- 1/8 CTB

CTO
(Color Temperature Orange)

- Double CTO
- Full CTO
- 3/4 CTO
- 1/2 CTO
- 1/4 CTO
- 1/8 CTO

A series of Plus Green and Minus Green color correction gels are also available.

Modifying the quality and color of illumination sources

"theatrical" gels

Image by Paul Wagner

- Primary Red
- Primary Green
- Primary Blue
- Deep Amber
- Congo Blue
- Night Blue
- Skelton Exotic Sangria
- Bastard Amber
- Dark Bastard Amber
- No Color Pink
- Surprise Pink
- No Color Blue
- Special Lavender

... and many more!

Shillman Media Studios

Green Screen Studio and **Television Studio** offer a comprehensive selection of tools

Both studios have a lighting grid and lighting board; additional lighting units available for use on stands; and a full complement of grip and electrical gear.

Grip Cart

C-Stand

Media Studios staff is available to help you plan your project and help you use the studio resources. Visit Shillman 225 to learn more.

Flags, Nets, Silks and Cookies

Diffusion Frame

Sand Bag

Apple Boxes

Grip Gear

Achieving creative goals with lighting

- **Expressive purpose** — what are you trying to convey with the lighting?
- **Motivation** — what motivates the sources in the scene?
- Expressive purpose and motivation are achieved through the combination of:
  a. Camera **exposure**
  b. Camera **white balance**
  c. **quality** of light sources
  d. **intensity** of light sources
  e. **direction** of light sources
  f. **contrast ratio** of the scene
  g. **color** of light sources
  h. **control/treatment** of light sources (cutters, diffusion, gobos, etc.)

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