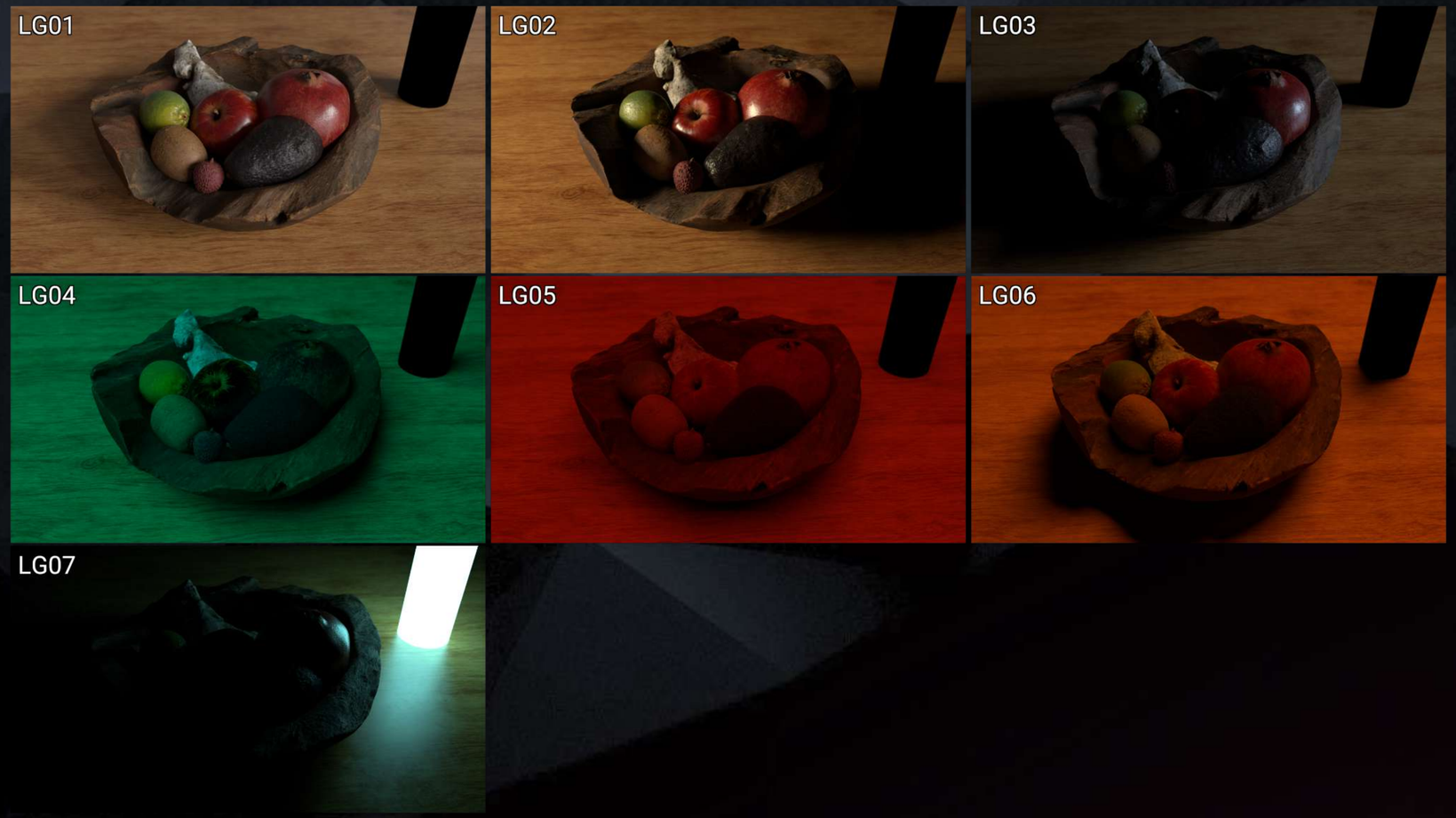
CG Compositing Series

Light Groups



CG Compositing Series

What is a Light Group?

- A Light Group is a render pass of a light (or a set of lights) in the scene, that is rendered in isolation from the rest of the scene's lighting.
- All other lights are "off" and only the Light Group's light is "on" and affecting the scene.
- All the Light Groups should add together to produce the full Lighting in the Scene; They all plus and build back the beauty render.

CG Compositing Series

Importance of Light Groups

- Creating good looking CG is not just about the materials of the objects, but also the Lights in the scene, that interact with those materials, and tell a story.
- Different Light types can drive the aesthetic, style, realism, or story of your CG render.
- Understanding lighting basics is important for being an effective CG compositor.

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Types of Light Groups

• Key	Primary Light Source	Sun, Moonlight, Window, Spotlight
• Fill	Lift and soften shadows	Sky Dome, Bounce lights
• Rim	Enhancing silhouette & separation	Backlight, Hair Light
• Practical	Light sources emitting in the scene	Screens, Lamps, Accent lights
• Interactive	Dynamic lights changing over time	Fire, Police Lights, Magic FX, Lightning

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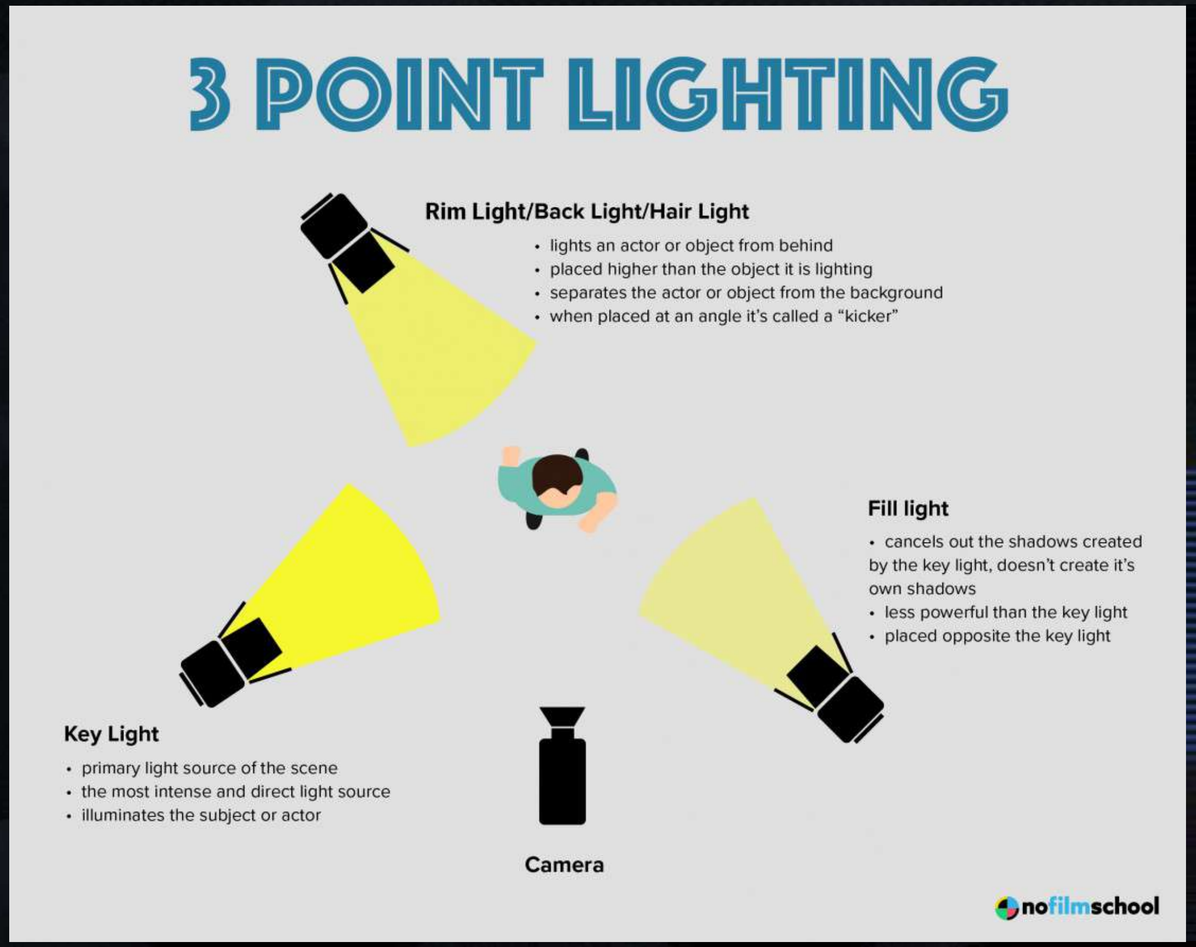
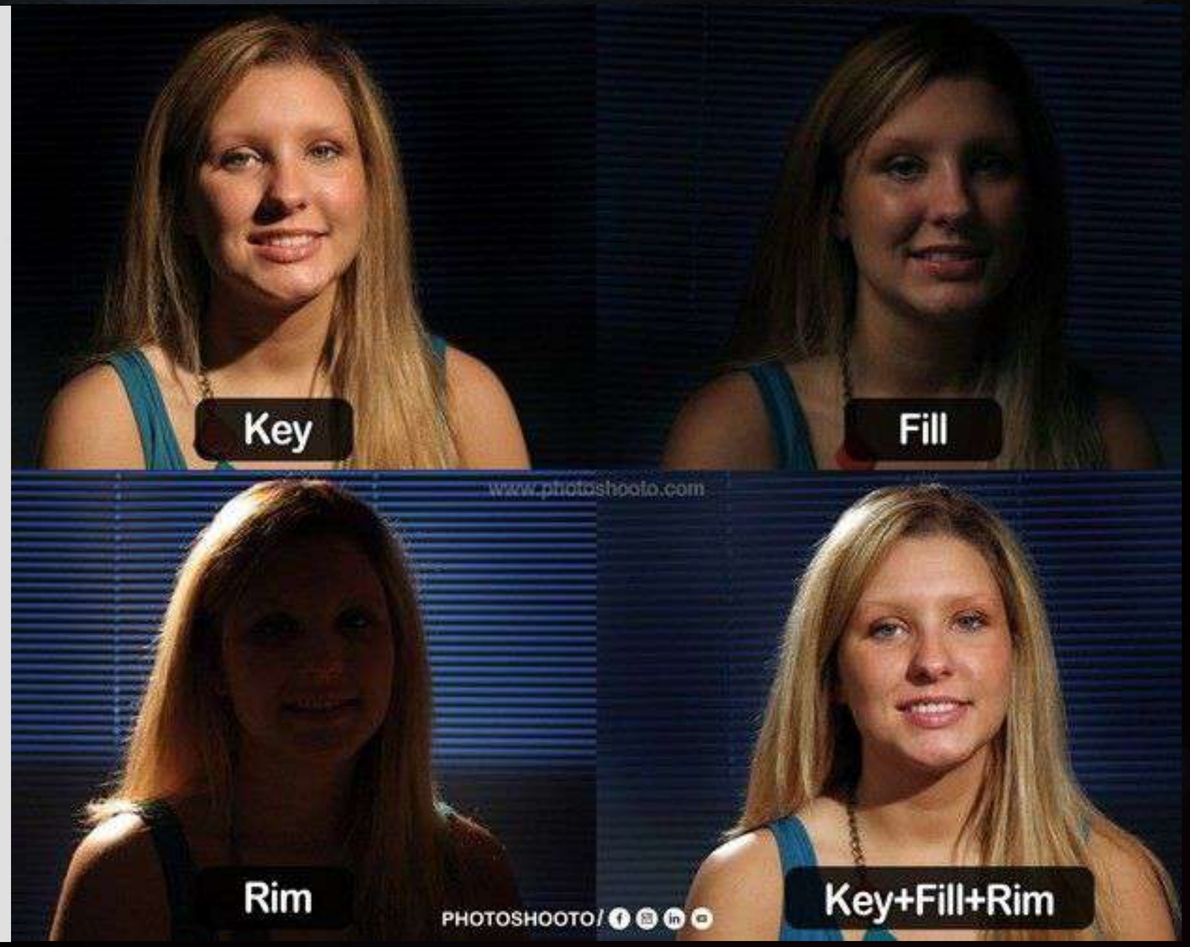
Key, Fill, Rim



https://nofilmschool.com/3-point-lighting



https://www.videomaker.com/how-to/lighting/lighting-design/three-point-lighting/

CG Compositing Series

Practical

https://www.therookies.co/projects/20802
by jeromefar on 3 Nov 2020

https://www.soundstripe.com/blogs/how-to-master-the-art-of-practical-lighting

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Interactive

https://giphy.com/gifs/animalkingdom-cJyQHn7KIBkz0J7goc

https://cdn1.participoll.com/wp-content/uploads/2019/07/21074300/fireplace-burning-fire-animated-gif.gif

Thor Ragnarok - 2017

Harry Potter and the Order of the Phoenix - 2007

CG Compositing Series

Light Groups for Compositors

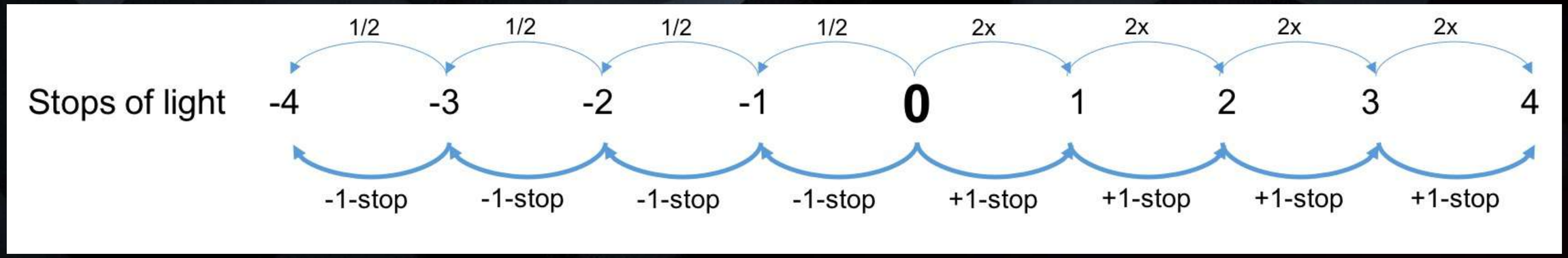
A Compositor is usually focused on 2 main aspects of the Lights using Light Groups:

1. Exposure: - How Bright the Lights are
2. Temperature - What Color (Hue) the Lights are

CG Compositing Series

Exposure

- Exposure is usually measured in “stops” of light.
- Stops are relative, meaning they are based on the current image you are looking at.
- +1 stop higher is 2x as bright. Doubled
- -1 stop lower is 1/2 as bright. Halved



https://www.john-rowell.com/blog/2017/3/27/what-is-a-stop-of-light

CG Compositing Series

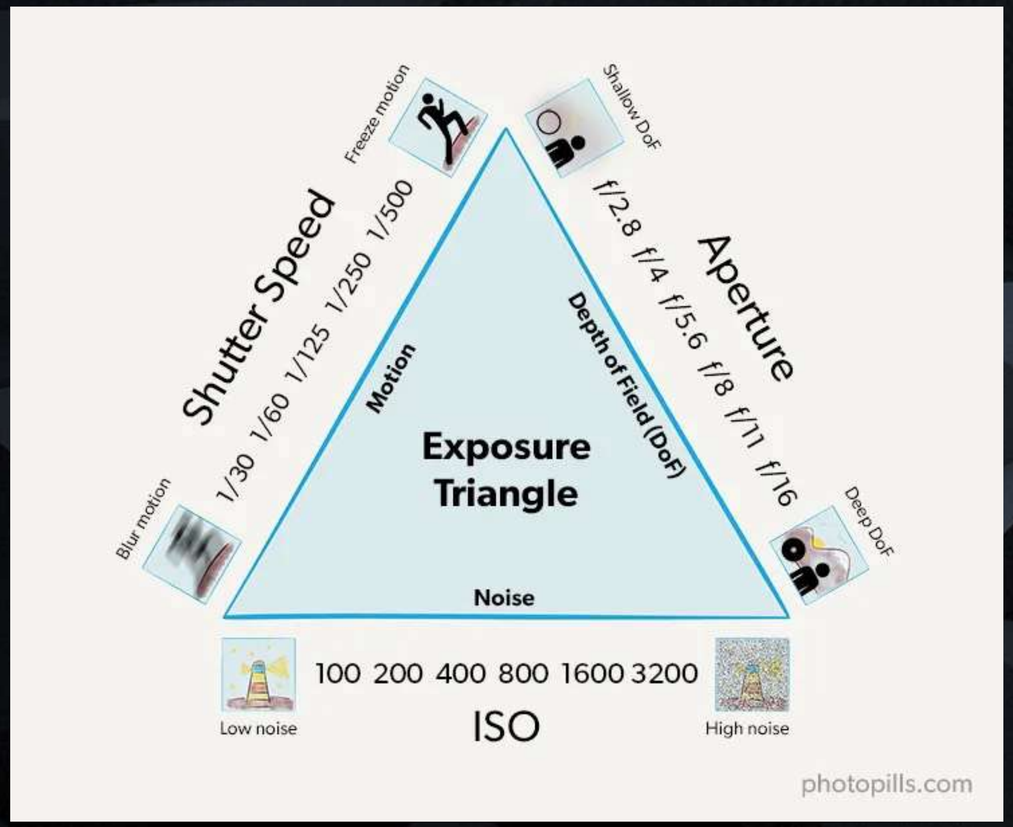
Exposure

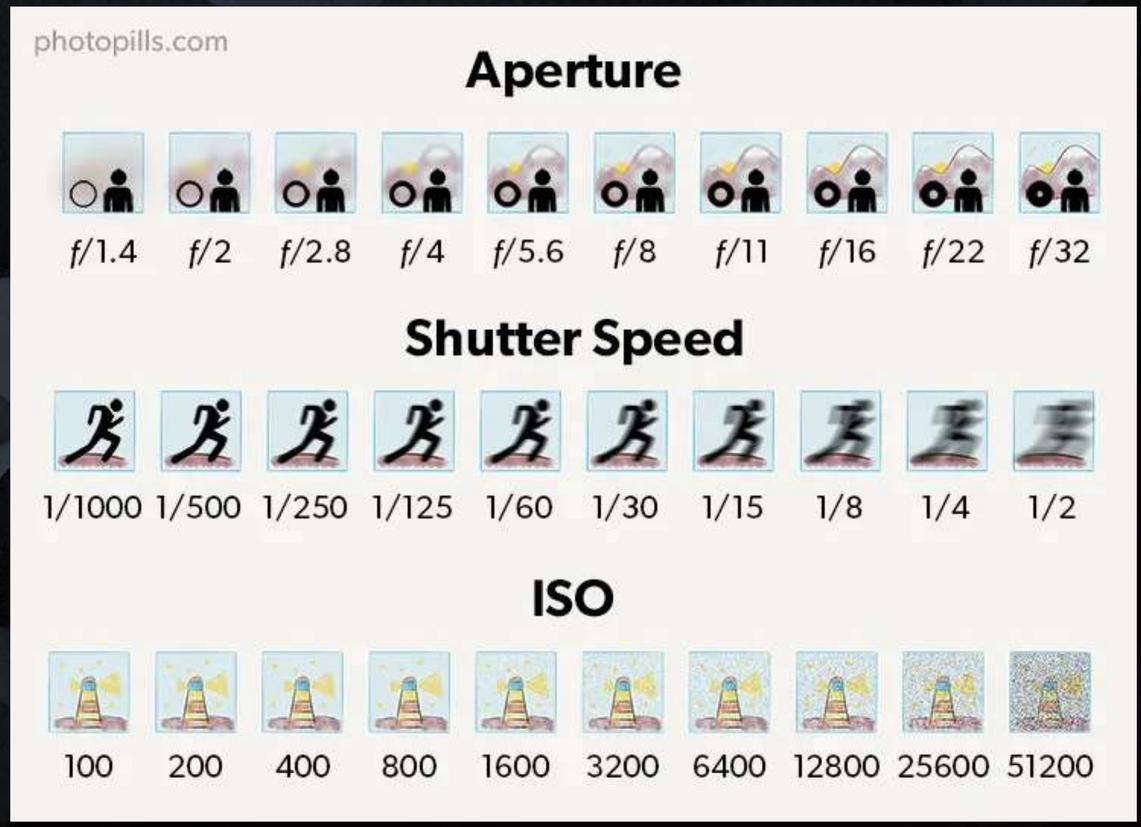
- Each stop is twice as bright as the previous, and half as bright as the next.

https://www.john-rowell.com/blog/2017/3/27/what-is-a-stop-of-light

CG Compositing Series

Photography Exposure Triangle





https://www.photopills.com/articles/exposure-photography-guide

CG Compositing Series

Aperture

- How big the opening of the lens is.
- The larger the lens opening, the more light gets through, the brighter the image.
- Also the bigger opening results in a shallower Depth of Field, or smaller zone of focus. This results in larger Bokeh and separation of foreground and background.

https://www.photopills.com/articles/exposure-photography-guide

f/2 - Large Aperture
Shallow Depth of Field

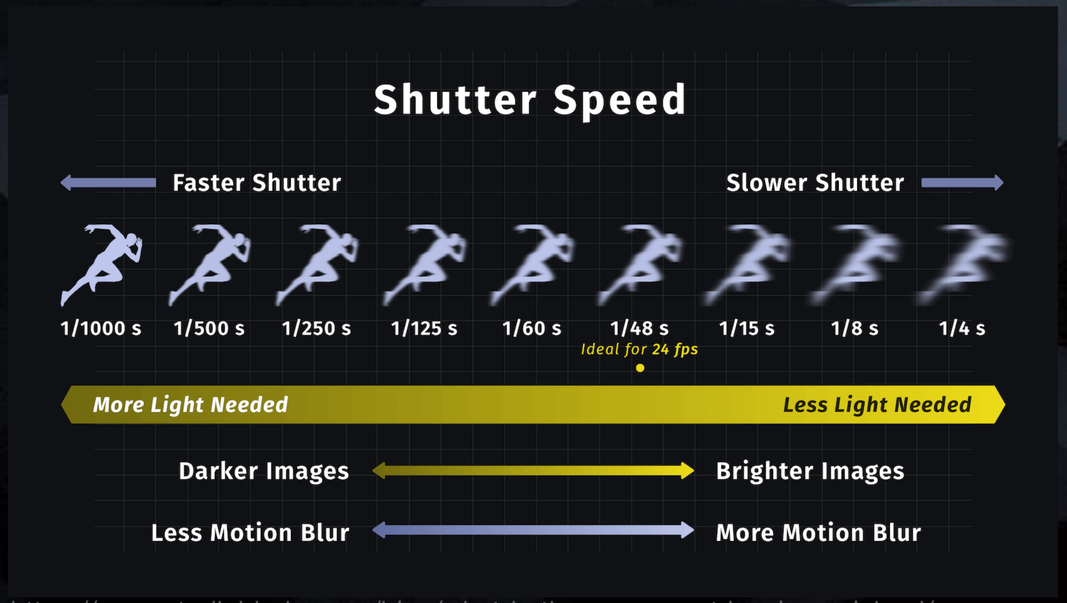
f/22 - Small Aperture
Deep Depth of Field

https://robynsphotographyacademy.com/understanding-aperture/

CG Compositing Series

Shutter Speed

- How much time the opening of the lens remains open for, measured in fractions of a second.
- Leaving the lens open for longer, lets in more light and brightens the image.
- Longer exposure times will result in more motion blur, depending on the shutter speed and speed of the object being shot.



https://www.studiobinder.com/blog/what-is-the-exposure-triangle-explained/

https://isblens.weebly.com/shutter-speed.html

CG Compositing Series

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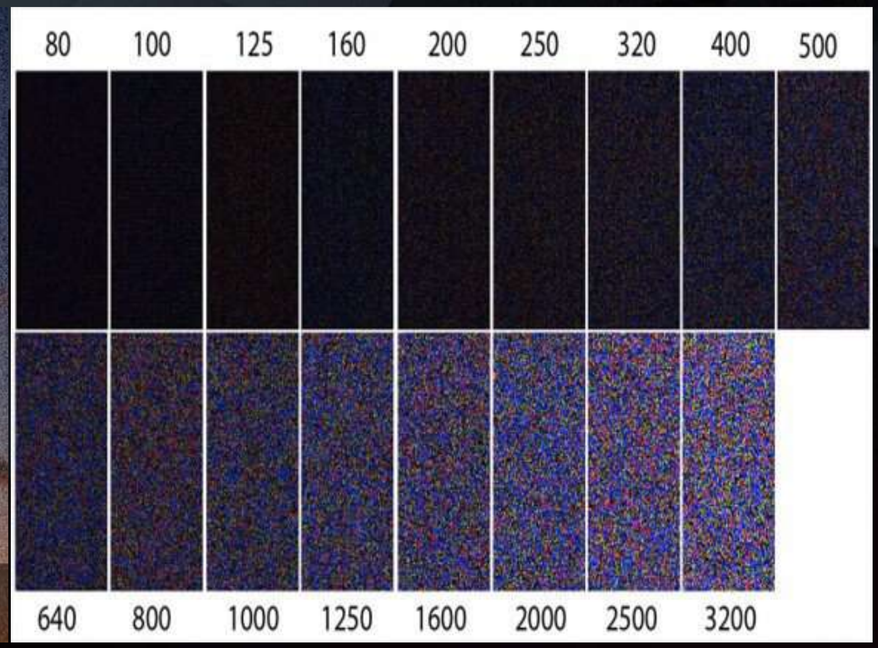
https://snapsnapsnap.photos/a-beginners-guide-for-manual-controls-in-iphone-photography-shutter-speed/

CG Compositing Series

ISO

- ISO used to refer to the sensitivity level of film stock in film cameras.
- With digital cameras, sensors have only one sensitivity level.
- Digital ISO refers to the Amplification (intensity multiplier) of the analog signal before it gets converted to digital data.



CG Compositing Series

ISO

- Digital ISO is a lot like a volume knob on a radio. If the signal is weak (aka there is not much light making it to the sensor) then increasing the volume will make the sound louder (make the image brighter) but will also increase the static, or digital noise (sometimes referred to as grain).

pexels.com photo by githirinick

Back to the Future

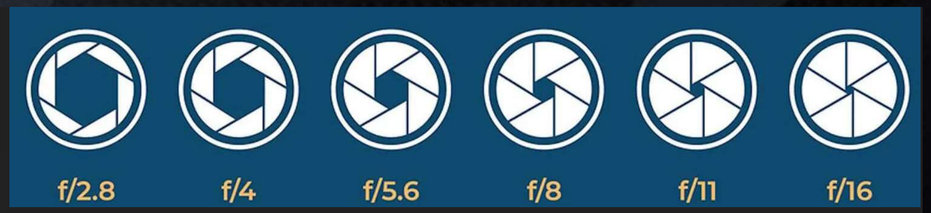
https://www.photopills.com/articles/exposure-photography-guide

CG Compositing Series

Aperture F-Stop & F-Numbers

Formally, the **f-number** equals: $\dfrac{\text{focal length}}{\text{aperture diameter}}$

For a lens of focal length f, if the aperture diameter is D, then: $\text{f-number} = \dfrac{f}{D}$.



https://www.studiobinder.com/blog/what-is-the-exposure-triangle-explained/

Imagine a 50 mm lens (that's the focal length):

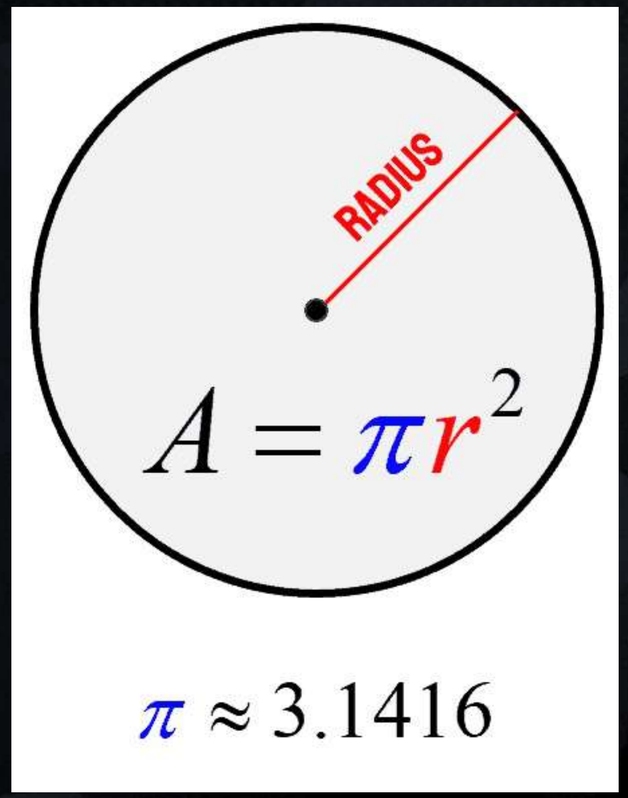
1. **At f/2:**
   - Aperture diameter $D = \frac{50\text{ mm}}{2} = 25\text{ mm}$ Diameter
   - Radius is half the Diameter,
     so $R = \frac{D}{2} = \dfrac{25\,\text{mm}}{2} = 12.5\,\text{mm}.$
   - A **25 mm diameter** (12.5 mm radius) is a big hole.

2. **At f/8:**
   - Aperture diameter $D = \frac{50\text{ mm}}{8} = 6.25\text{ mm}$ Diameter
   - Radius is half the Diameter,
     so $R = \frac{D}{2} = \dfrac{6.25\,\text{mm}}{2} = 3.125\,\text{mm}.$
   - A **6.25 mm diameter** (3.125 mm radius) is a **much smaller** hole.

- The "f/" notation is just a convenient shorthand that says, "**the aperture diameter is $\frac{1}{(\text{that number})}$ of the focal length.**"
- They're called **"f-stops"** because each **stop** roughly halves or doubles the amount of light admitted into the camera

CG Compositing Series

Aperture - Area of Circle vs Radius



https://www.chilimath.com/lessons/geometry-lessons/area-of-a-circle/

- Doubling the Amount of Light requires doubling the Area of the Circle (lens opening)
- Doubling the Radius does not double the Area, it actually quadruples it. $2^2 = 4$, $(2 \times 2)^2 = 16$
- What do we need to multiply the Radius by to get double the Area?

$$2A = \pi(xr)^2,$$

where $A = \pi r^2$. Solving for x proceeds as follows:

$$2\pi r^2 = \pi x^2 r^2 \implies x^2 = 2 \implies x = \sqrt{2}.$$

$\sqrt{2}$ is approximately 1.4142.

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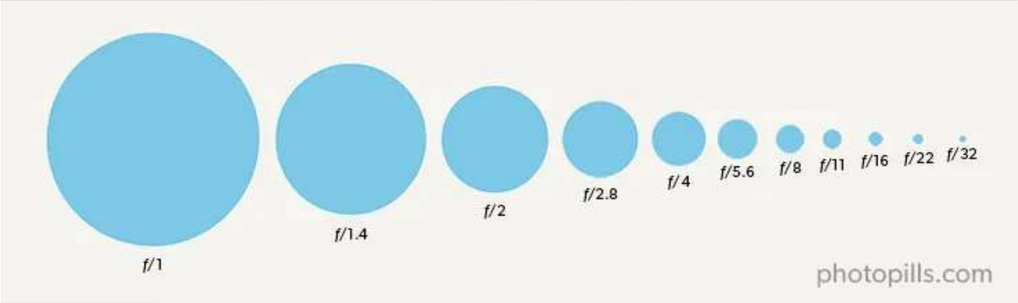
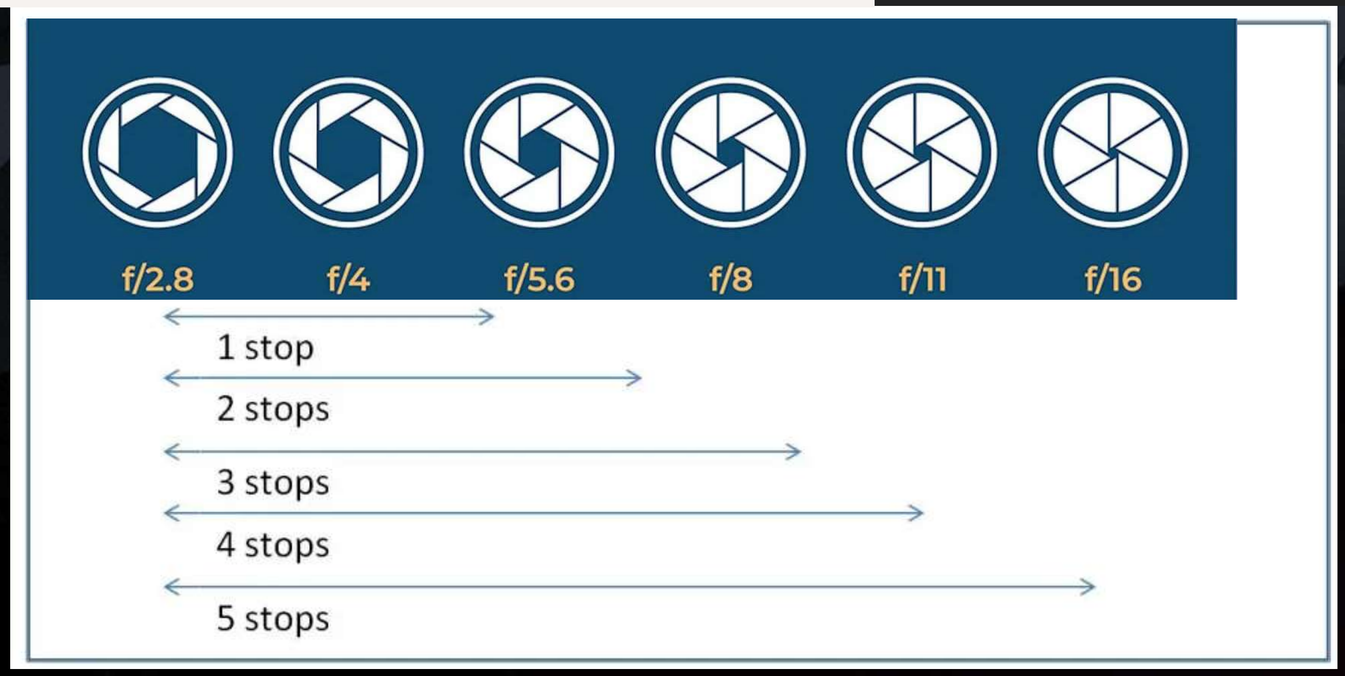
Aperture F-stop Numbers Explained



Multiplying by $\sqrt{2}$ or ~1.4142 each time

$\sqrt{2} \times \sqrt{2} = 2.$ Doubling every other time



CG Compositing Series

Temperature

https://www.rmd-leuchten.de/en/color-temperature/

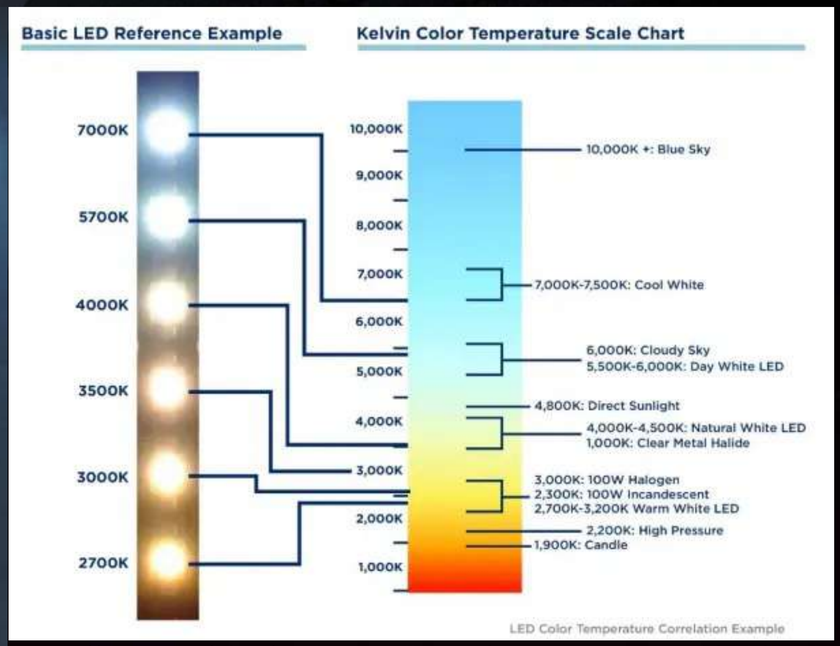
https://gvmled.com/what-is-the-color-temperature-in-lighting/

CG Compositing Series

Temperature

- Temperature describes the hue, or color of the light, measured in Kelvin (K).
- Heated objects emit light photons as they heat up, in a process called Black-Body Radiation.
- As objects get hotter they emit different frequency wavelengths of light, shifting from red to orange to white to blue.

https://lednetwork.ca/blogs/the-led-network-blog/what-is-colour-temperature-why-is-it-important-for-lighting



https://rbw.com/blog/understanding-color-temperature-of-led-lighting

CG Compositing Series

Temperature

Color	Kelvin (K)	Celsius (°C)	Fahrenheit (°F)
Red	1000–2000 K	700–1700 °C	1300–3100 °F

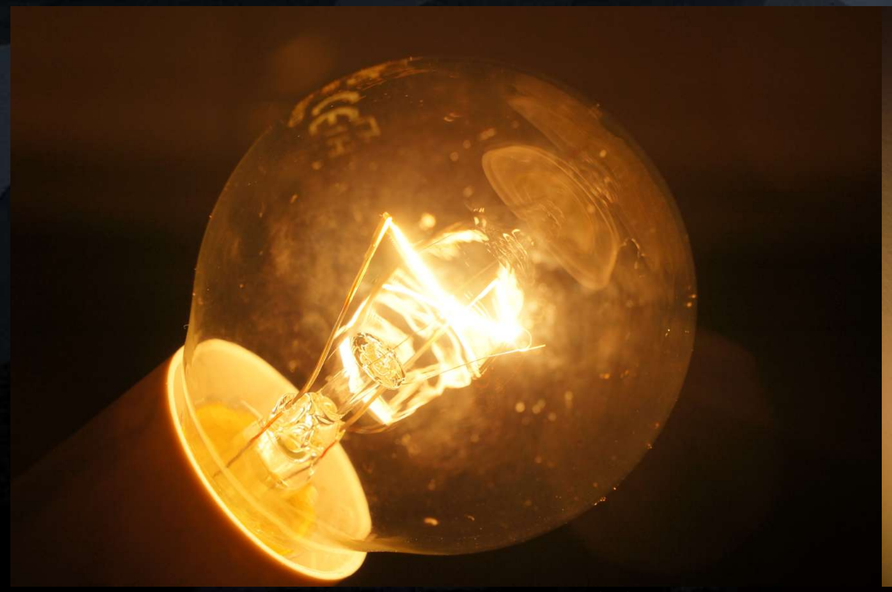
pexels.com photo by Hanifi Sarıkaya

https://en.m.wikipedia.org/wiki/File:Toaster_Filaments.JPG

CG Compositing Series

Temperature

Color	Kelvin (K)	Celsius (°C)	Fahrenheit (°F)
Orange -Yellow	2000–3500 K	1700–3200 °C	3100–5800 °F
White	3500–6500 K	3200–6200 °C	5800–11200 °F



https://study.com/cimages/multimages/16/tungsten_filament_in_an_incandescent_light680178481860127020.png

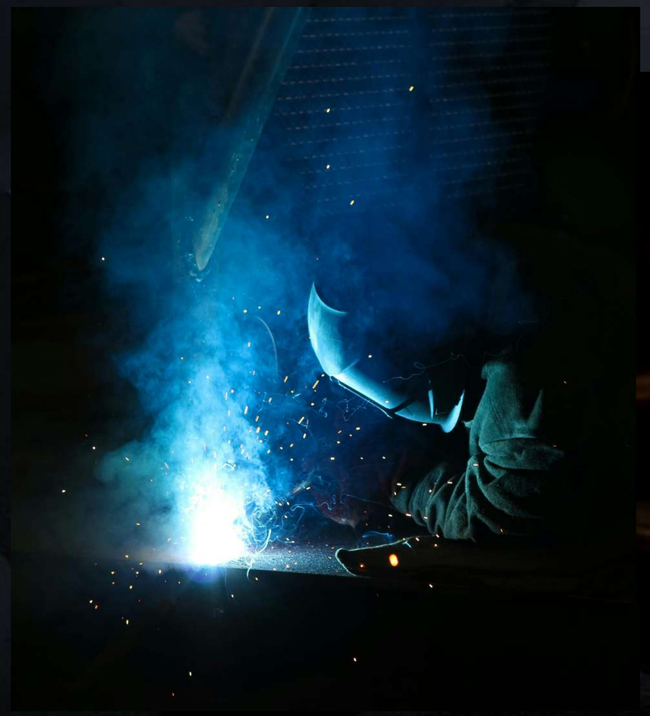
pexels.com photo by Brett Sayles

https://english.mathrubhumi.com/news/kerala/no-rain-in-karkidakam-kerala-heading-towards-major-power-crisis-1.8822925

CG Compositing Series

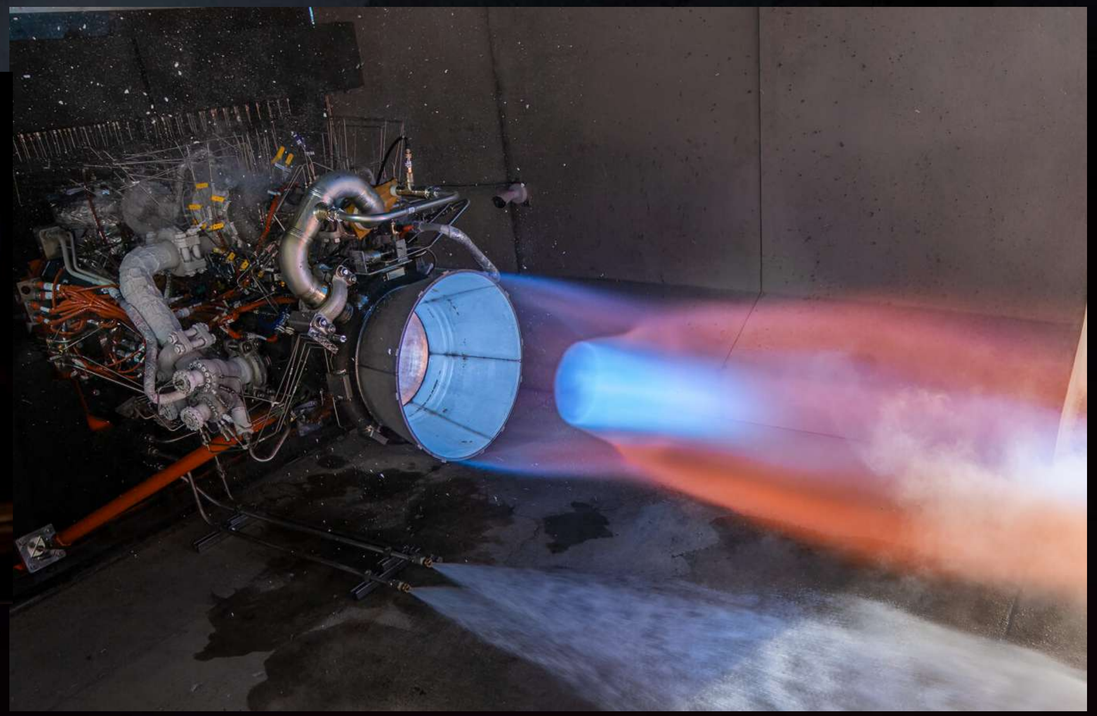
Temperature

Color	Kelvin (K)	Celsius (°C)	Fahrenheit (°F)
Blue	6500+ K	6200+ °C	11200+ °F



pexels.com photo by Kateryna Babaieva

https://www.wonderopolis.org/wonder/what-is-the-color-of-fire



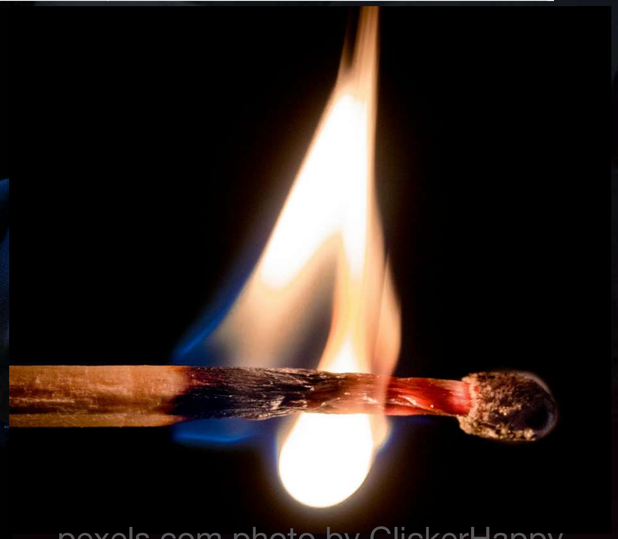
https://www.autoevolution.com/news/staged-combustion-engine-fires-up-for-the-first-time-spits-out-350000-hp-in-one-second-235304.html

CG Compositing Series

Temperature

Color	Kelvin (K)	Celsius (°C)	Fahrenheit (°F)
Red	1000–2000 K	700–1700 °C	1300–3100 °F
Orange -Yellow	2000–3500 K	1700–3200 °C	3100–5800 °F
White	3500–6500 K	3200–6200 °C	5800–11200 °F
Blue	6500+ K	6200+ °C	11200+ °F

pexels.com photo by CottonBro



pexels.com photo by ClickerHappy