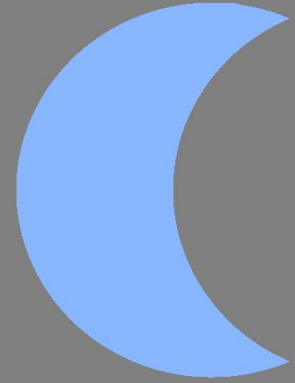
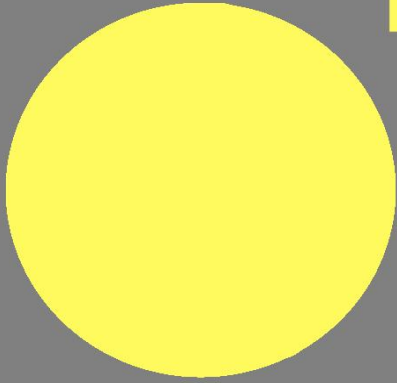


Natural Light



Artificial Light



Brian Hillier

24 November 2025

Artificial Light – What we will cover

- Definition of Artificial Light
- Development of Artificial Light
- Brief history of Artificial Light
- Technical Topics
- What is "White Balance
- Examples of photographs taken with Artificial Light
- Future of Lighting

Artificial Light - Definition

What is Artificial Light

- Natural light is produced by the Sun and the Moon
- Artificial light is produced from man-made sources

Why Artificial Light is important

- Enables work to take place after sun-set
- Increases safety and security
- Essential for modern technology

Development of Artificial Light

Early days – Fires, Torches, Oil lamps

1802 – Electric Arc Lamp - Humphrey Davy

1820 – Limelight - Thomas Drummond

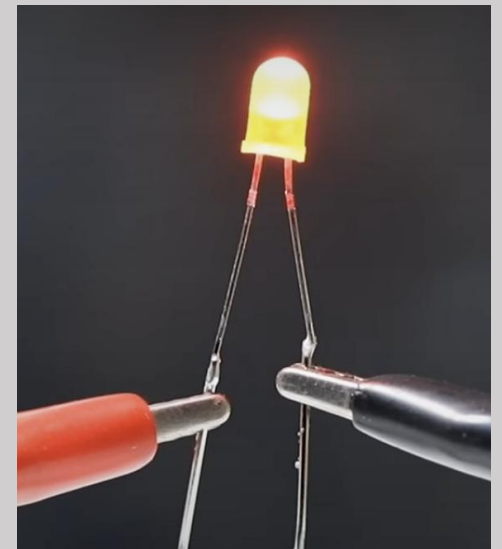
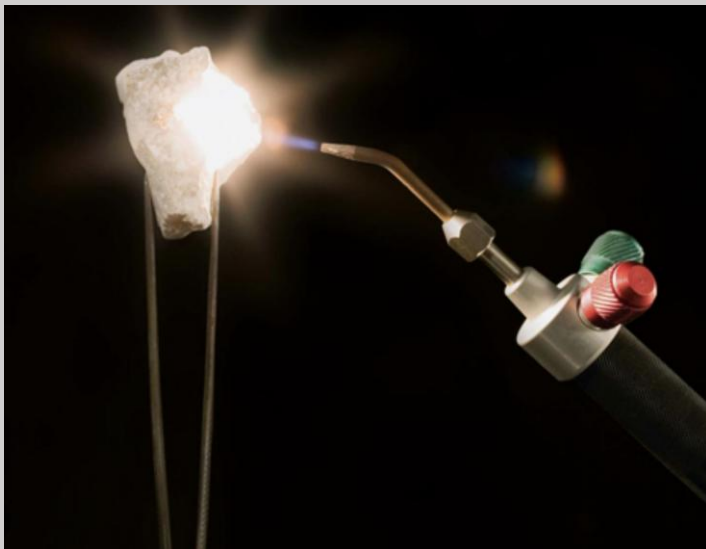
- Oxygen + Hydrogen flame on Quicklime(Calcium Oxide)
- Used in Theatres, American Civil War -

1879 - Incandescent filament light bulb - Thomas Edison patents

1938 – First Fluorescent lamps

1962 – First LED (Light Emitting Diode)

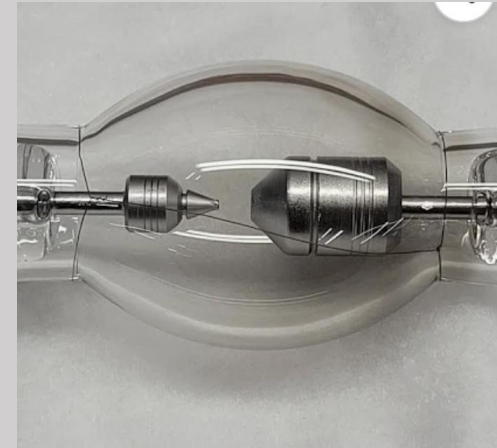
Brief History of Artificial Light - Types of Lighting



Brief History of Artificial Lights - Electric ARC



Home made 18 Volts



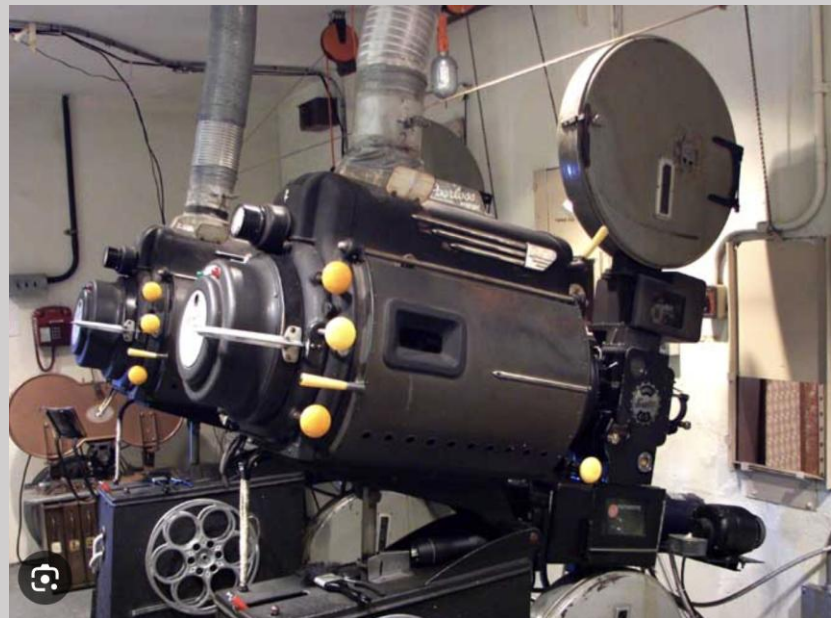
Osram 1000Kw – Arc lamp

35 mm Cinema Projector

Notice a pair of projectors,

When film cassette runs out the other projector has the next cassette and is started

The next film cassette is loaded on other projector, ready to run



Artificial Light – Technical Topics

- Photon
- Candela
- Lumens
- Primary Colours
- Colour Temperature
- White Balance
- Flash

What is a photon - In simple terms

Photons are the smallest possible particles of electromagnetic energy and therefore also the smallest possible particles of light.

Photons can travel at the speed of light because they have no mass (thanks to relativity).

Photons also have no charge.

Candela (cd) is the SI unit of luminous intensity

The SI unit of luminous intensity,

Measures the amount of light emitted in a specific direction.

It is used for lamps, spotlights, and other focused light sources and is approximately equal to the light from a traditional candle.

Unlike ***lumens***, which measure total light output, ***candelas*** measure the intensity within a beam.

Candelas are useful for products like car headlights, spotlights, and navigational lights.

Lumens

Lumens are a measure of luminous flux

The total amount of visible light a source produces, making them a direct indicator of brightness.

Measure of brightness: Higher lumen count indicates brighter light, It is now the standard way to measure brightness for light bulbs.

Total light output: Lumens measure the total amount of visible light emitted in all directions, regardless of where the light is directed.

Replaces watts: Lumens are the modern standard because watts measure energy, not light output.

Modern LEDs can produce the same brightness (lumens) as older incandescent bulbs while using significantly less energy (fewer watts).

Types of Primary Colours

Subtractive Colour - Traditional

- Red, Yellow, Blue
- Used for Paints

Additive Colour – Lighting

- Red, Green, Blue
- Used for Display Screens, eg TV

Subtractive Ink - Printing

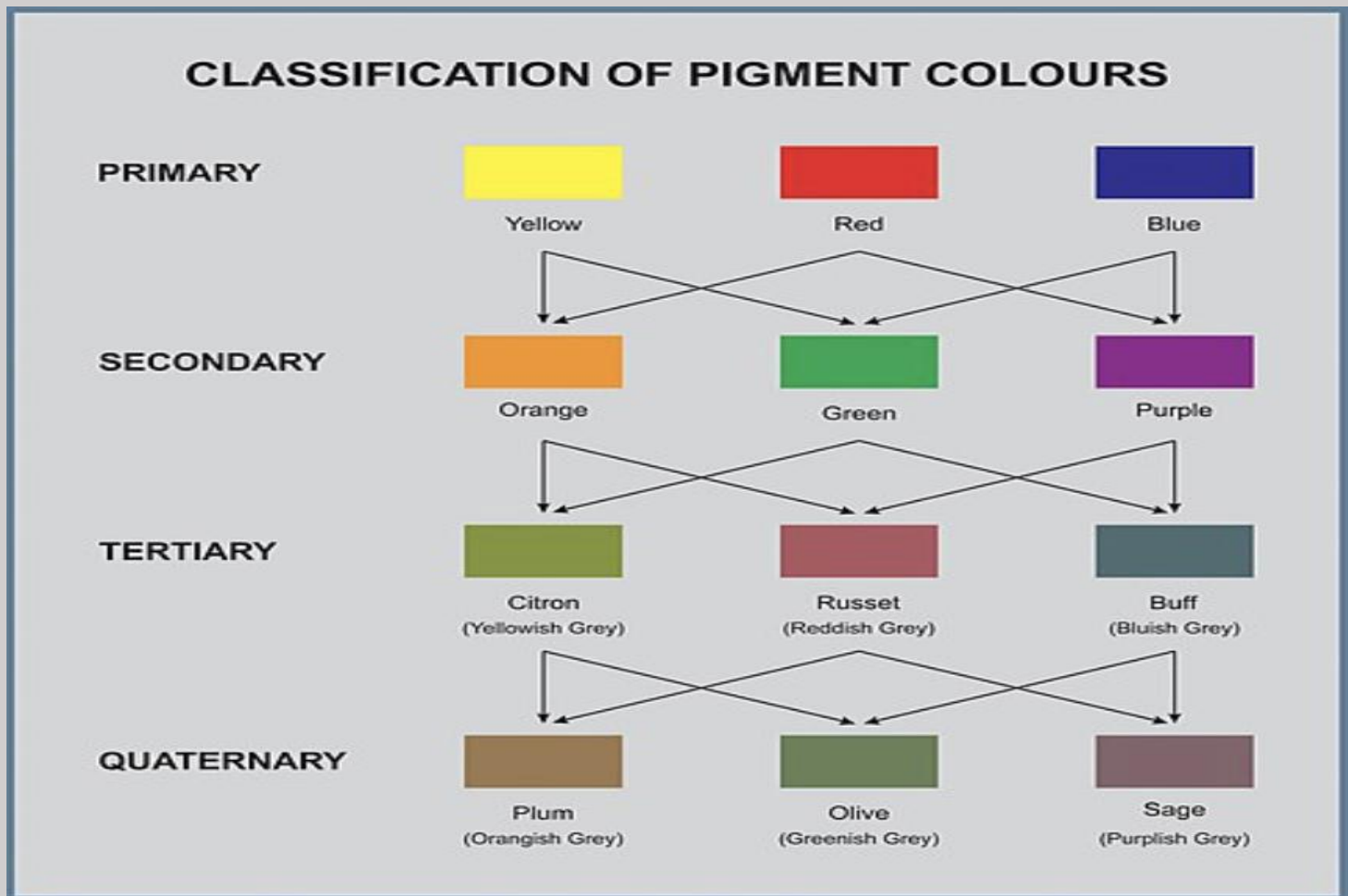
- Used in Printing

Tertiary colour: Combining a primary and secondary colour results in a tertiary colour.

- For example, mixing a primary colour like red with a secondary colour like orange creates red-orange

Primary Colours - Subtractive – Pigments/Paints

Red, Yellow, Blue: These are the primary colours



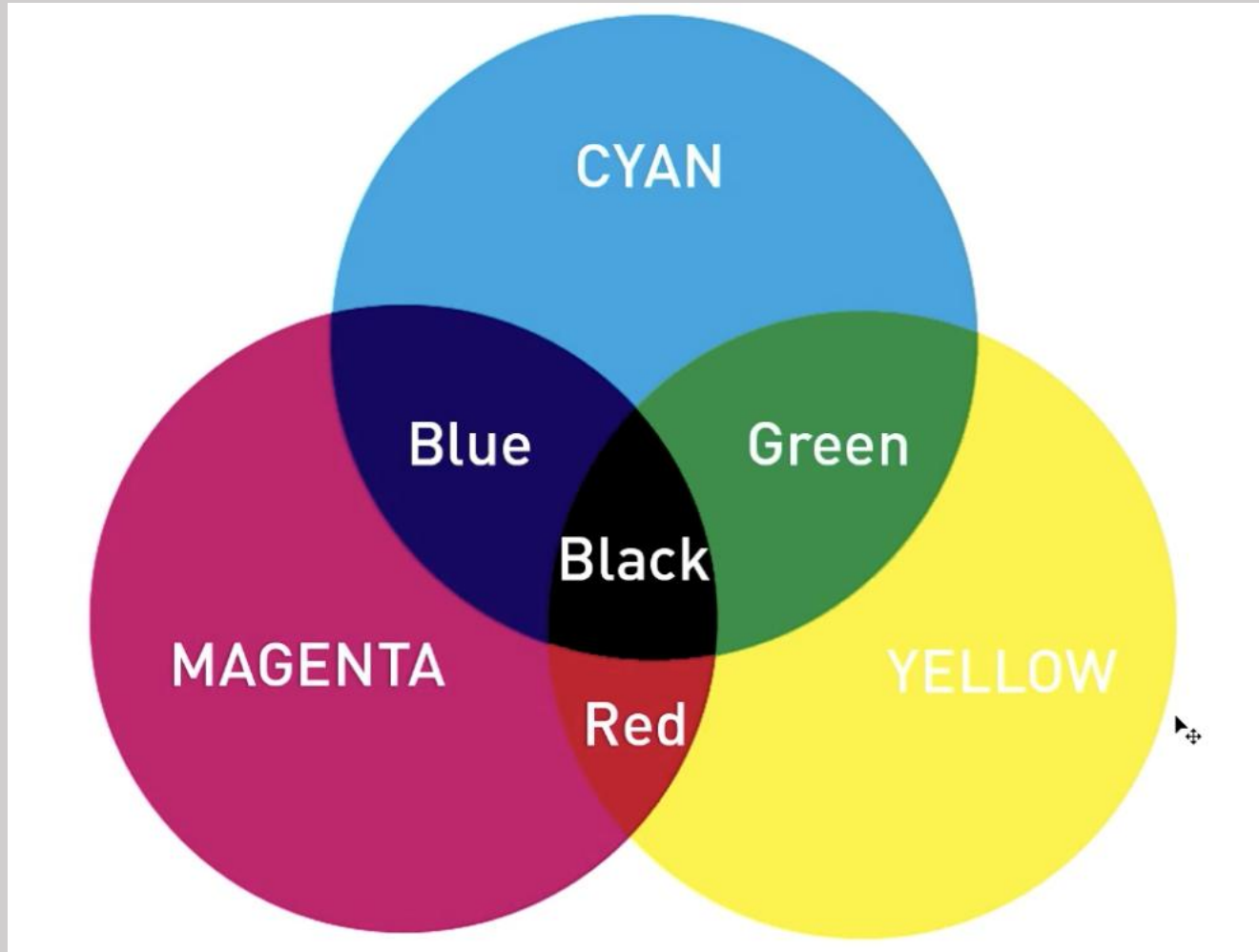
Primary Colours – Additive – TV Screens

Red, Green, Blue: These are the primary colors when mixing light, like on computer screens and televisions.



Primary Colours – Subtractive Ink - Printing

Four colour inks - Cyan, Magenta, Yellow, Black:



What is White Balance

White balance is a camera setting that adjusts colours so that white objects appear white.

Ensures colours in a photo look more realistic and natural, prevents unwanted tints from different light sources like incandescent bulbs or fluorescent lights.

Photographer uses white balance to make a white shirt look white under tungsten light instead of a yellow-orange hue.

To assess the White Balance the photographer may photograph a grey card then look at the image to see if grey card has any colour tints.

Using Grey cards to assess white



Kelvin Scale - Measurement of colours

Vision light is a thermal radiation measured in Kelvin units

Kelvin scale is 1,000K (candlelight) to 10,000K (blue sky)

- **Candlelight:** 1800K - 2000K
 - **Tungsten bulb:** 2800K - 3200K
 - **Sunrise/sunset:** 2500K - 3500K
 - **Overcast daylight:** 6000K - 7000K
 - **Midday sunlight:** 5500K - 6000K
-
- **Tungsten:** 3200K (warm, yellowish light, like indoor bulbs)
 - **Daylight:** 5500K (balanced, natural light)
 - **Shade:** 7000K (cool light with a slight blue cast)
 - **Cloudy:** 6500K (cool light with a subtle blue hue)
 - **Sunrise/Sunset:** 50,000K (warm, golden light)

Incorrect White Balance



Color Cast

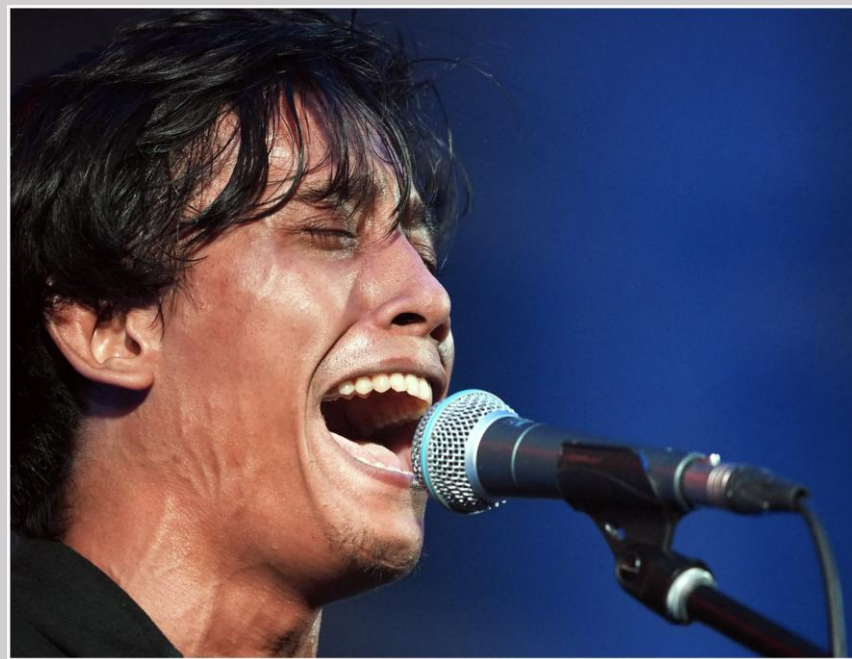


Daylight White Balance

White Balance – Differences



Should one always adjust White Balance?



White Balance - considerations

White balance

compensates for the colour temperature of the light source by adding the opposite colour to the image, this neutralizes the cast and makes whites appear white.

Human vs. camera vision:

Our eyes and brains are good adjusting for different light sources,

But digital cameras record the exact colour temperature, so a white balance setting is needed for accurate colours.

How does White Balance work

Color temperature:

The "**temperature**" of light, measured in [Kelvin K](#), determines whether it looks warm or cool.

Warm light: Lower Kelvin numbers
e.g., 3,000K from incandescent bulbs
have a reddish-yellow tint.

Cool light: Higher Kelvin numbers
e.g., 8,000K from shade on a sunny day
have a blue tint.

How to choose the right Colour Temperature

Warm white 2700K–3000K

This light is yellow-white

Creates a relaxing, cozy, and inviting atmosphere,
making it ideal for living rooms, bedrooms, dining areas.

It has a yellow tint, similar to old incandescent bulbs

Neutral white 3500K– 4100K

This is a more balanced "white" light,
often used in kitchens and bathrooms

Cool white 4000K–5000K

This light is bluer and crisper,
promoting alertness and concentration,
making it suitable for workplaces and garages.

Photos using different lighting

Candles

Warm and white

Neutral white

Cool White

Flash

Fluorescent

Candle light – by Maria Bailey



Lantern - Probably electric



Christingle Service 2017 – Anatalia by Brian Hillier



Blue cast or Warm and White



Neutral white – Home interior



Neutral white – Home interior



Cool white – Laboratory



Cool Colour – can create a mood



Camera with Ring Flash – Eliminates side shadows



Ring Flash – Eliminates shadows from a side flash



Bounce Flash – Surrounds the subject with light



Flash –Fill-in with Speeds – 1/250 – 1/160 - /100 – 1/60



Fluorescent light – can be Daylight, Warm, Cool



Fluorescent light - This has a slight green tint



Artificial Light – the end

Artificial Light has a wide range of topics, indeed too many to present in a single presentation

I frequently use the Internet to research photographic topics and I would recommend that you do the same.

I hope you found my presentation interesting

and

Thank you for listening