

BOOK OF LIGHT

Photography Light and Form
By Hong Zhou

Introduction

In this book titled “Book of Light”, I share the knowledge and insights I gained from the course “Light and Form” taught by Kevin Gater at Mittuniversitetet Sundsvall.

Within the pages of my “Book of Light,” I not only delve into the teachings from Kevin Gater’s course on “Light and Form” but also reflect on my own photographs, highlighting what succeeded and areas where improvement can be made.

It is my aspiration that through reading this book, your comprehension of light in photography will expand, allowing you to further refine your artistic vision.

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Ambient Light

Available light

Ambient light

Encompasses both natural light, whether it originates from outdoor sources or filters in through windows, as well as artificial illumination, such as conventional room lighting.

Foam-board offers a versatile option for modifying ambient light, while diffusion serves as an alternative method to transform the characteristics of ambient light. Moreover, a reflector can be utilized to bounce and redirect ambient light, while negative fill can effectively absorb unwanted light. Lastly, the use of a silver reflector allows for capturing textural details in the scene.

► This photograph was captured on Norra Berget at approximately 15:49, during the moments leading up to sunset.

We had a limited 5-minute timeframe to photograph the subject in order to capture the beautiful golden rim light. Additionally, we employed a speedlight with an silver umbrella to illuminate the face and eliminate any shadows present.



135mm 1/200s ISO 400 f/5,6
Norra Berget, 21 Feb 2023



85mm 1/320s ISO 250 f/1,2
Kiruna Pastorat, 2 Mar 2023

Natural light shining through green stained glass.

Temperature White balance

The color temperature of your camera is measured in Kelvin degrees, which is determined by the white balance setting.

By utilizing a color chart like the color checker passport, you can establish the white balance during a shoot or make color corrections in post-production.

▼ From left to right:

- Auto white balance
- Tungsten, typically around 3200 Kelvin
- Fluorescent, varies depending on the type 3000 to 6000 Kelvin.
- Daylight, Generally around 5500 to 6500 Kelvin.
- Cloudy, Usually around 6000 to 7000 Kelvin.
- Flash, Similar to daylight, around 5500 to 6500 Kelvin.
- Shade, Varies depending on the amount of direct sunlight, but generally around 7000 to 9000 Kelvin.
- User define (K)



Ambience priority mode on canon RA

Exposure Triangle Bright/Dark

The image quality of your photographs is significantly influenced by three key factors: ISO, aperture, and shutter speed.

ISO refers to the sensitivity of your camera's image sensor to light. Higher ISO values increase the camera's sensitivity, allowing you to capture images in low-light conditions. However, higher ISO settings can introduce digital noise or graininess into your photos.

Aperture, measured in f-stops, determines the amount of light that enters your camera through the lens. A larger aperture (smaller f-number) allows more light to pass through, while a smaller aperture (larger f-number) restricts the amount of light. Aperture also impacts the depth of field in your images, influencing the sharpness or blurriness of different areas.

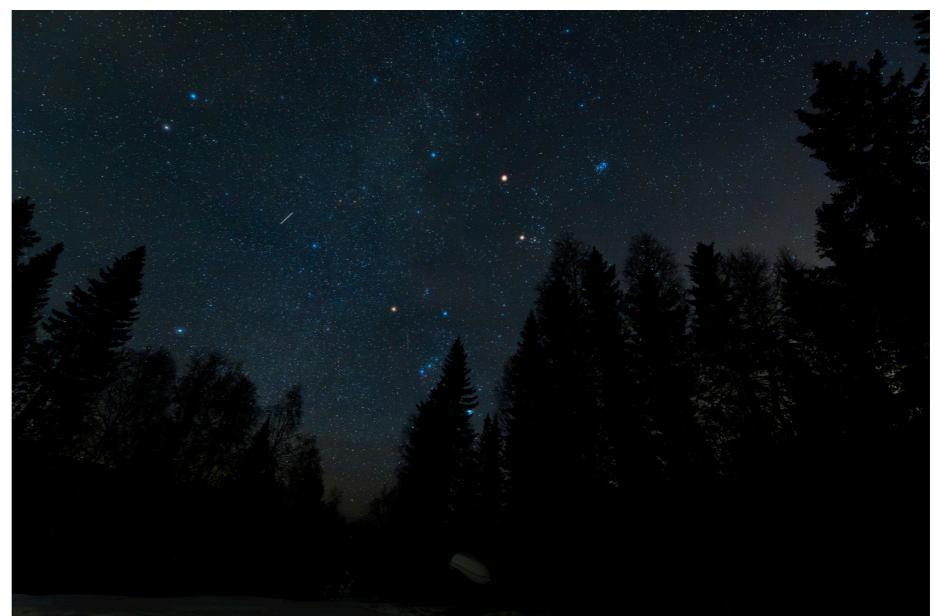
The aperture scale operates on a logarithmic basis, with each step down (e.g.,

from f/2 to f/2.8) halving the amount of light reaching the sensor. Understanding the aperture scale helps you control the exposure and depth of field in your photos.

Additionally, the size of your aperture affects the depth of field, which determines the range of sharpness in your image. A wider aperture (smaller f-number) results in a shallower depth of field, where the subject is in focus while the background appears blurry. Conversely,

a narrower aperture (larger f-number) increases the depth of field, resulting in more elements being in focus throughout the image.

By mastering ISO, aperture, and shutter speed, you can effectively control the exposure and achieve the desired image quality in your photographs. Understanding how aperture impacts both light intake and depth of field allows you to create images with the desired level of sharpness and blur.



15mm 8s ISO3200 f/2,8
📍 National park Skuleskogen, 11 Feb 2023

▲ Longer shutter speed captures more light (photons) which results in more details in night sky photography and less noise.

Histogram - Visualise Quantity

A useful tool for visualizing the quantity of reflected light is the histogram, which can typically be accessed on the LCD display of your camera. The histogram provides valuable information about how light is affecting your scene and serves as a warning if certain areas are overexposed or underexposed.

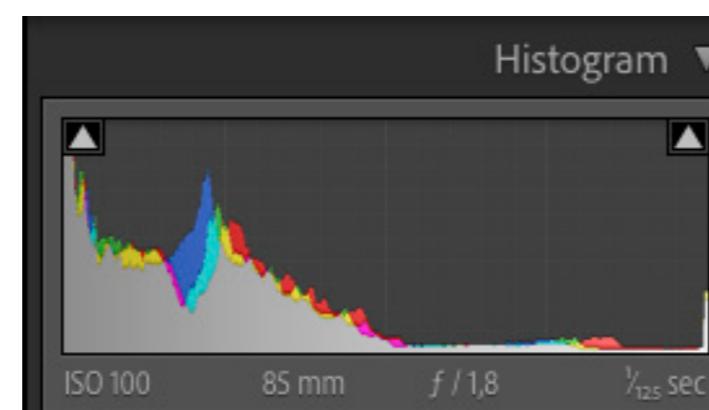
When examining the histogram, if the majority of the data falls towards the left side, it indicates a dark image, potentially with some pixels appearing as pure black. Conversely, if the data is predominantly towards the right side, it suggests a bright image, with the possibility of some pixels being pure white.

In the case of a histogram with peaks or hills at both ends, it signifies a high contrast image. At this point, it becomes important to make a creative decision regarding whether to prioritize the highlights or the shadows, based on the desired outcome for your photograph.

It's important to note that there is no universally "best" histogram. The ideal histogram is one that accurately represents both your subject matter and the intended message or mood you wish to convey through your photograph.



85mm 1/125s ISO100 f/1,8
📍 Mittuniversitetet C/D Building, 22 Feb 2023



Histogram leans more to the left side there are some pure black pixels on the shadows of Óscar's clothing and some pure white pixels because of the speedlite behind Óscar.

Dynamic Range - Tonal Range

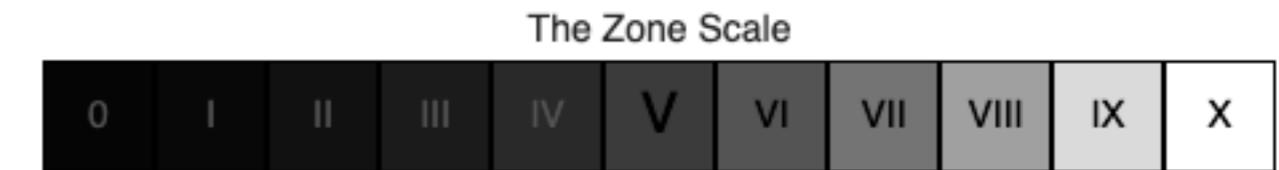


73mm 0,6s ISO100 f/32 & 73mm 1/5s ISO100 f/32
📍 Pusshållsplats, 25 Jan 2023

Dynamic range refers to the difference between the darkest and lightest tones in an image, typically represented by pure black and pure white. It is measured in "stops," where each stop signifies a doubling or halving of the brightness level. The Zone System, on the other hand, divides a scene into ten tonal areas and assigns a specific zone to each area, with each zone equivalent to a one-stop difference.

To compensate for underexposure or overexposure, one approach is to blend multiple exposures. This involves capturing several images of the same scene at different exposure settings, a technique known as auto exposure bracketing (AEB). By merging these exposures during post-processing (In Photoshop -> Automate -> Merge to HDR pro -> Select Batch), the tonal range can be expanded, resulting in a final image that showcases a more balanced representation of both highlight and shadow details.

*Ansel Adam's Zone system he is a renowned landscape photographer in black and white medium.



Ansel Adam's Zone system source Wikipedia.

Metering - Light Measurement

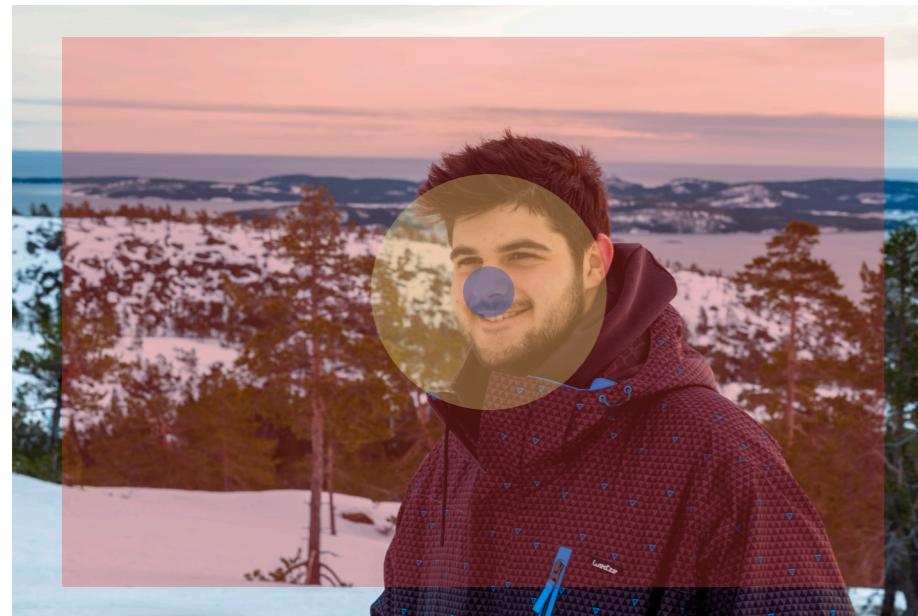
Your camera should have an exposure level indicator. Metering is the process of reading light in order to determine the settings needed (aperture, shutter speed and ISO) to get a correct exposure.



Exposure comp./ AEB setting on canon RA

Metering modes

- Spot metering, Takes into account only a small area of the image in the center of the viewfinder or in the selected focus point.
- Partial metering, Similar to the Spot Metering, but with a larger circle.
- Center weighted metering, The camera gives a greater weight to the light intensity located in a circular area in the center of your viewfinder.
- Evaluative or Matrix metering, Takes into account the entire frame to carry out the light intensity metering and the exposure calculation.

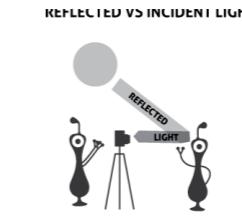


- Matrix/ Evaluative Metering
- Center-weighted Metering
- Spot Metering

85mm 1/60s ISO500 f/16
National park Skuleskogen,
12 Feb 2023

Incident light meters

read the light that falls upon them, they are not colour or density challenged.



source: theinspiredeye.net/
photography-gear/lumu-review/



source Light metering Basics:
Using an incident Meter by
Robert Machado:youtu.be/
HDYzqSNaENE

Comparison



85mm 1/160s ISO100 f/9
Ungdomsfältet, 18 May 2023



85mm 1/160s ISO100 f/9
Ungdomsfältet, 18 May 2023

The image on the left was captured without the use of any light modifier, while the image on the right was taken with the inclusion of a diffuser.

Studio Light



85mm 1/1000s ISO800 f/1,2
© Mittuniversitetet R Building Studio, 15 Apr 2023

Types of Light

Hard light is characterized by a relatively small light source compared to the subject, while soft light is produced by a larger light source in relation to the subject.

Hard light can result in striking shadows, while soft light has a tendency to envelop objects, creating diffuse shadows. Direct light is straight-on, occasionally harsh, and may exhibit warmth and vivid colors. On the other hand, diffused light is gentler, lacking the intensity and glare of direct light. It scatters and emanates from various directions.

In portrait photography, soft light is typically preferred over hard light, except in cases where hard light is intentionally chosen as the preferred lighting style.



85mm 1/250s ISO800 f/1,2
© Mittuniversitetet R Building Studio, 15 Apr 2023

In this portrait, soft light is utilized, while noticeable harsh shadows add to the overall contrast.

Quality of Light

A bright sunny day will create a hard light.
An overcast day will create a soft light.

Size and Distance affects Light Quality

As the distance between your light source and subject decreases, the background will appear darker. The inverse square law explains the reduction in light over distance. According to the law, the power of the light will be inversely proportional to the square of the distance.

In studio photography, softboxes are employed to produce a soft light effect. For those on a budget, a China ball can serve as a cost-effective alternative to achieve a similar softbox effect. Additionally, a window can act as a free and natural softbox.

Studio lights

Too much light or too little, can ruin a photo. By learning the types of lighting and how they affect your camera you can avoid common problems.

There is a variety of lights and light modifiers.

Strobes

A strobe light is like camera flash, creating a short burst of light. A benefit of strobe lighting is that a burst of light won't make pupils larger, leaving more iris color.

Continuous Light

Continuous lights are less powerful, but are more affordable. Continuous lights are often easier to work with because you see the light in real time, rather than adjusting for flash. Continuous lights are common with product photography.

Modifiers

Softboxes and other types of diffusers soften the light, creating a more gradual transition between the light and dark areas of an

image. A shoot through umbrella diffuses light like a softbox. A reflective umbrella bounces light back at the subject. Often used in fashion, a beauty dish creates a more vibrant light than a softbox, but without the same extreme, hard shadows of direct light.

By placing barn doors or panels on all four sides of the light, you can leave the doors open and get a wide light or focus the light down by closing any combination of doors.

Grids, are modifiers that focus the light down to a smaller area. The light hits the subject but then quickly falls off to leave the rest of the scene dark.

Bounce is an effective way of filling shadows without using additional lights.

Gels give light color. These can be used to troubleshoot - like making a flash match the orange of the sunset in the scene - or to get creative and add unexpected color.

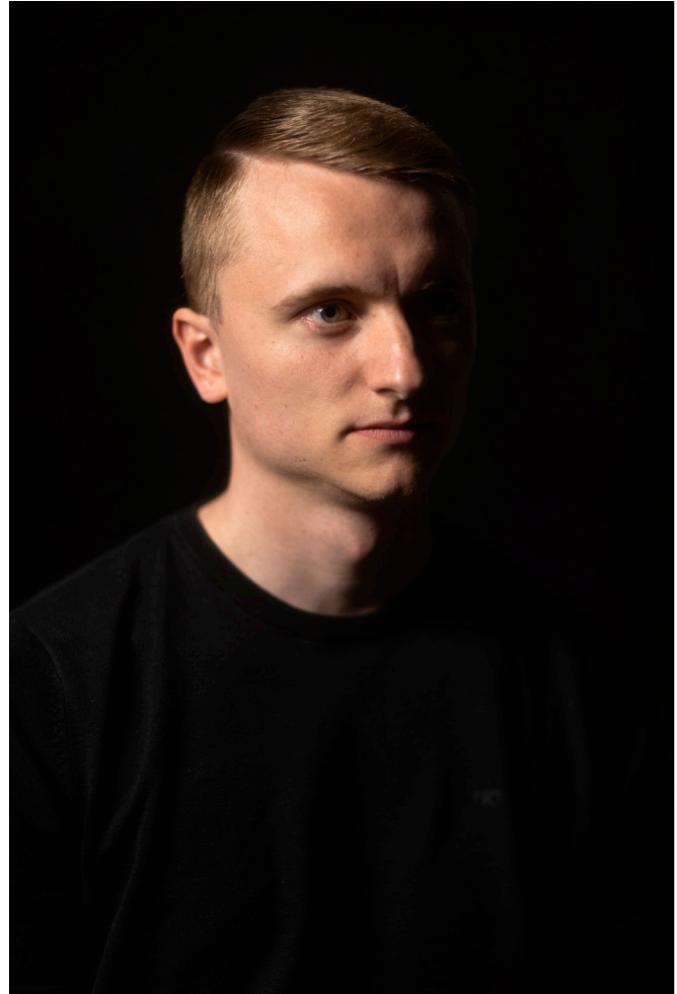
Single light setups

Single light setups in photography involve the use of a solitary light source to illuminate the subject. This minimalist approach to lighting can be highly effective in creating a variety of moods, emphasizing specific elements, or achieving dramatic effects. By strategically positioning and modifying the single light source, photographers can shape the shadows, highlights, and overall lighting balance to achieve their desired artistic vision. Single light setups offer a versatile and focused lighting solution, allowing for creative experimentation and capturing captivating imagery with simplicity and elegance.

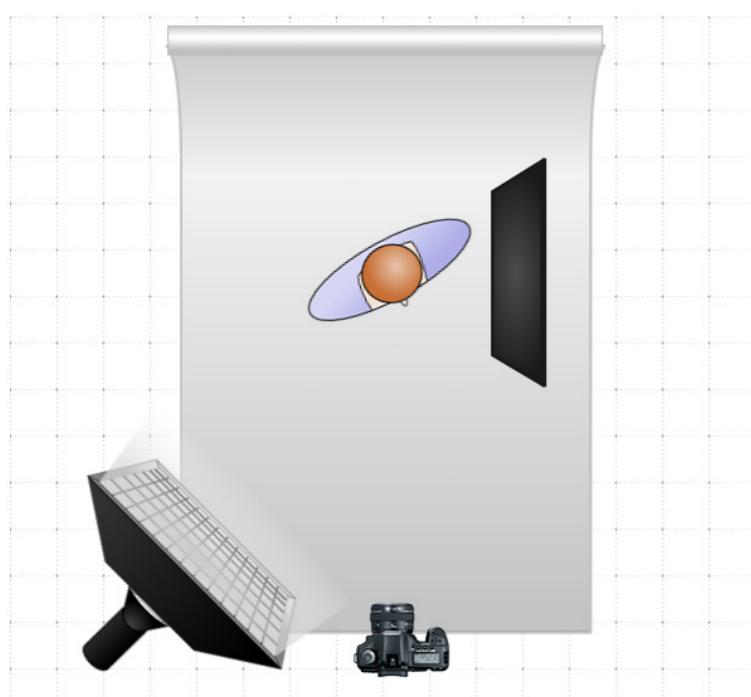
check list shoot:

- Are you getting enough light?
 - Is the light hard or soft?
 - Do you need to fill any shadows?
 - Do you need to block or absorb light?
 - Are the eyes catching the light?
- Is your subject getting lost in the background?

Split Lighting

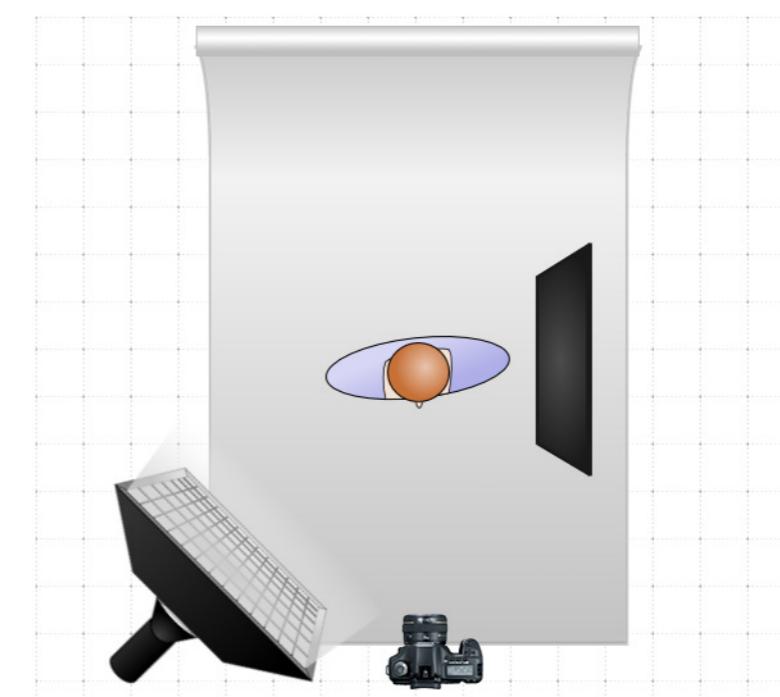


Loop Lighting



Split Lighting, by lighting the half of the face and leave the rest in a strong shadow it creates a dramatic/ moody image.

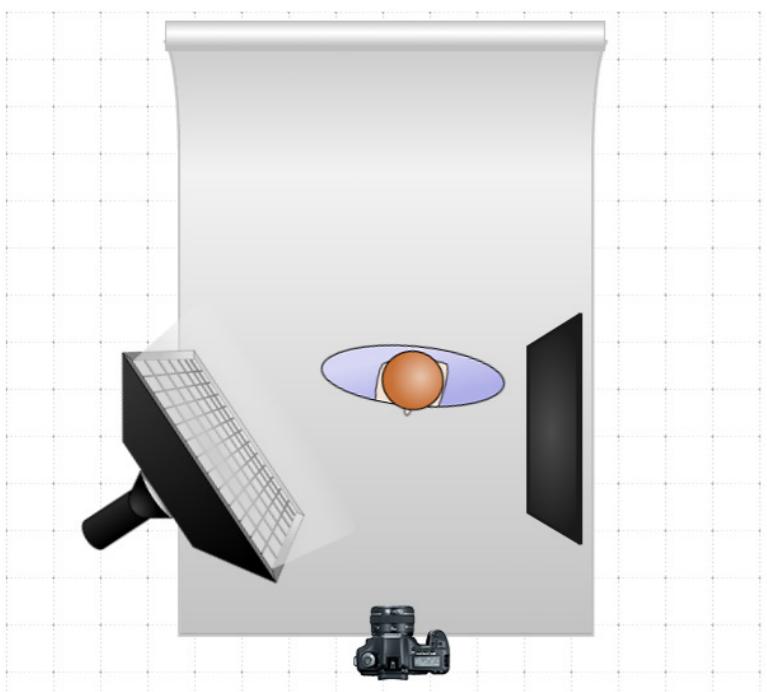
Light needs to be at (above) eye level.



Loop lighting is where the subject is lit from about 45 degree in front of them and above.

It creates a nose shadow that 'loops' down at an angle onto their cheek.

Rembrandt Lighting



Rembrandt lighting, is a studio portrait-lighting where a small inverted triangle of light is visible under the subject's eye. It creates beautiful and compelling portraits with very little equipment.

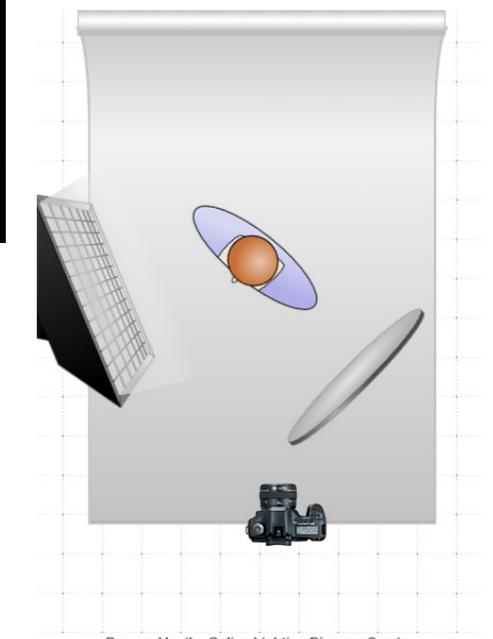
Key light, (approximately 12 to 18 inches above eye level).

Short Lighting



Short lighting is where the subject is lit from the side of the face farthest from the camera.

It is a flattering lighting pattern for most faces and has the effect of visually narrowing a wider face.

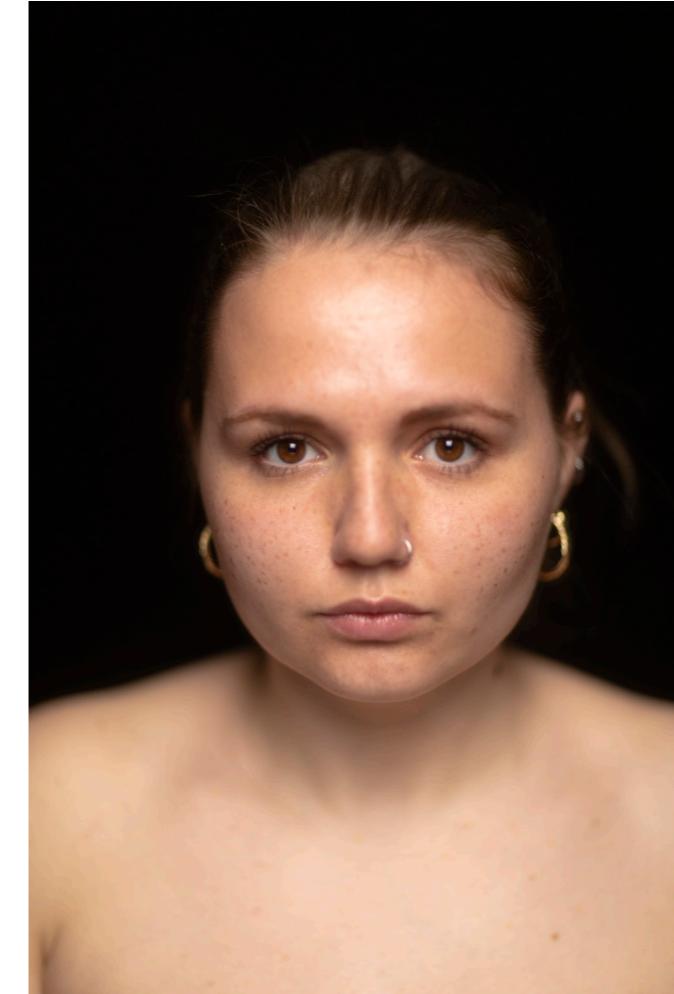


Powered by the Online Lighting Diagram Creator

Broad Lighting

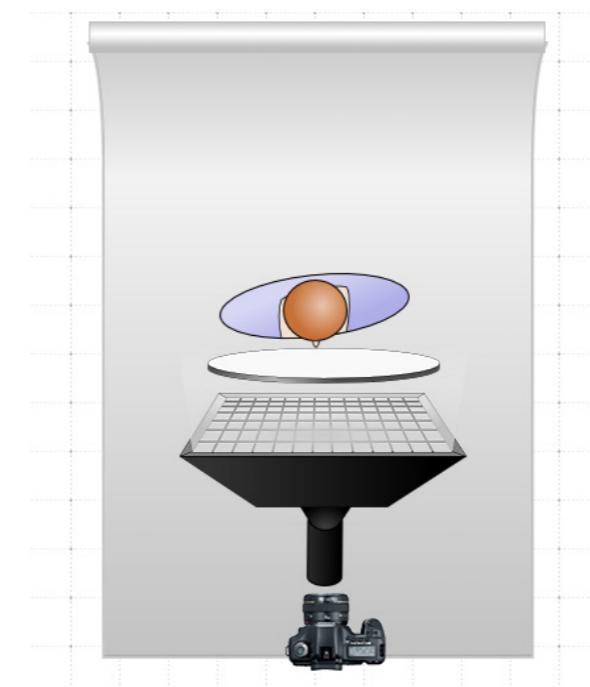


Butterfly lighting



Broad lighting creates the illusion of making the face appear broader.

Broad light is when you frame your portrait so that the brighter side of the model's face is closer to the camera.



The light is placed above your subject causing your subject's nose to cast a butterfly shaped shadow underneath. It's also known as 'Paramount lighting'. named for classic Hollywood glamour photography.

Key light(+/- 3 feet above eye level).

* Recommended key light heights are relative to the distance from the subject. For example, if the light is farther away, it would need to be higher.

Colour



85mm 1/250s ISO1250 f/1,2
© Mittuniversitetet R Building Studio, 18 Apr 2023

Colour temperature

Unlike light quality, the colour of light can be objectively determined by using a colour temperature meter. Different lighting situations would have different colour temperatures which are measured in kelvin.

What is colour?

Color can be defined by particular wavelength(s) of light. A pure color will have one particular wavelength such as 450nm will appear as a vibrant blue.

Humans can see from about 400nm (violet) to 750nm (red). Below 400nm is Ultraviolet light and above 750nm is infrared.

The human eye is most sensitive to Green and Yellow. Tonal contrast affects our perception of colour.

RGB

Colour shifts when you're printing HSB, RGB, CMYK, lab.

Our photos are composed of using the RGB spectrum

Color luminance affects black & white photography.

recipes:

- Triadic
- Split complementary
- Tetradic
- Analogous
- Complementary

Applying colour theory:
Adobe color -> Sample ->
The recipe.
You don't have them to be equals to prioritise.

HSL

Luminance, brightness, value (luminosity)

Every color has its own luminance. Pure black 0% pure white 100% grey 50%. Blue: 44% (closer to black) Yellow: 94% (closer to white).

Challenge: See world in black & white for a bit to get better in contrast.

Picture style:
Monochrome: 3, 0, N, N

Colour harmony

subtractive color wheel,
additive color wheel.
Different color mixing

Gels

To modify the colour of your lights source you can use gels. The main color correction gels are CTB (color temperature blue) and CTO (color temperature orange). A CTB gel converts tungsten light to 'daylight' color. A CTO gel performs the reverse.

A flash is daylight balanced. Using a tungsten white balance setting, the light from the flash is going to become blue.



Color temperature orange (CTO)

Enhancing your photography can be achieved by incorporating gels onto your lights, allowing you to create vibrant and daring visuals with a touch of color.

In this particular case, a Color Temperature Orange (CTO) gel is utilized to introduce a bluish tone to the background. To maintain a neutral skin color, the white balance is adjusted to tungsten setting.

85mm 1/125s ISO100 f/8
📍 Ungdomsfältet, 18 May 2023

◀ Flash with CTO and whitebalance set to tungsten.

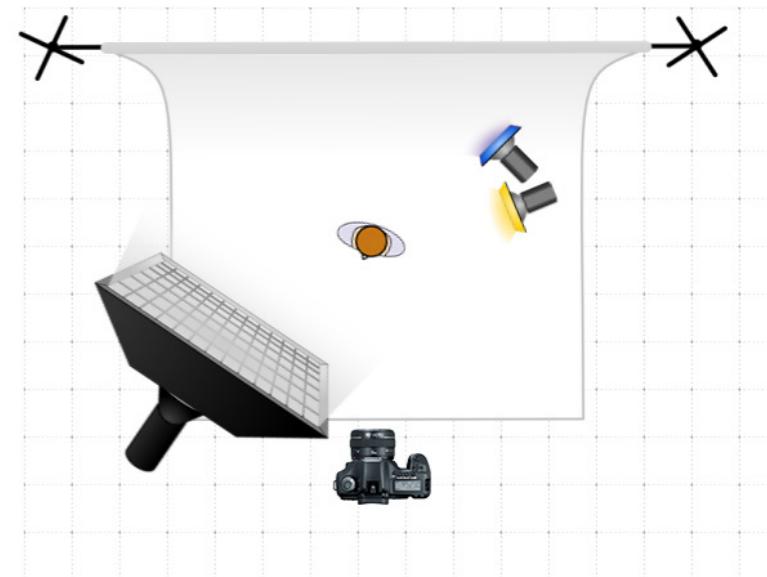
Reflection

In this picture a background light is introduced. This helps to separate Mia from the background.

An RGB light stick with the colour purple is set. With this technique you can easily change the background of your portrait.



85mm 1/50s ISO500 f/2,2
📍 Mittuniversitetet R Building Studio, 27 Apr 2023



Neutral skin and cold highlight

Neutral light

In this picture the Key and backlight are warm.

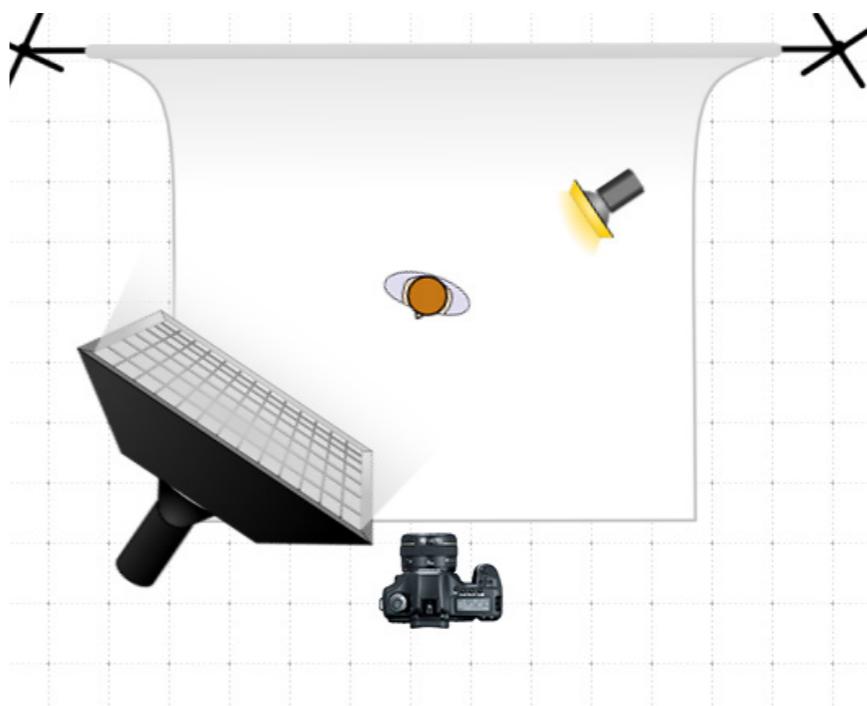
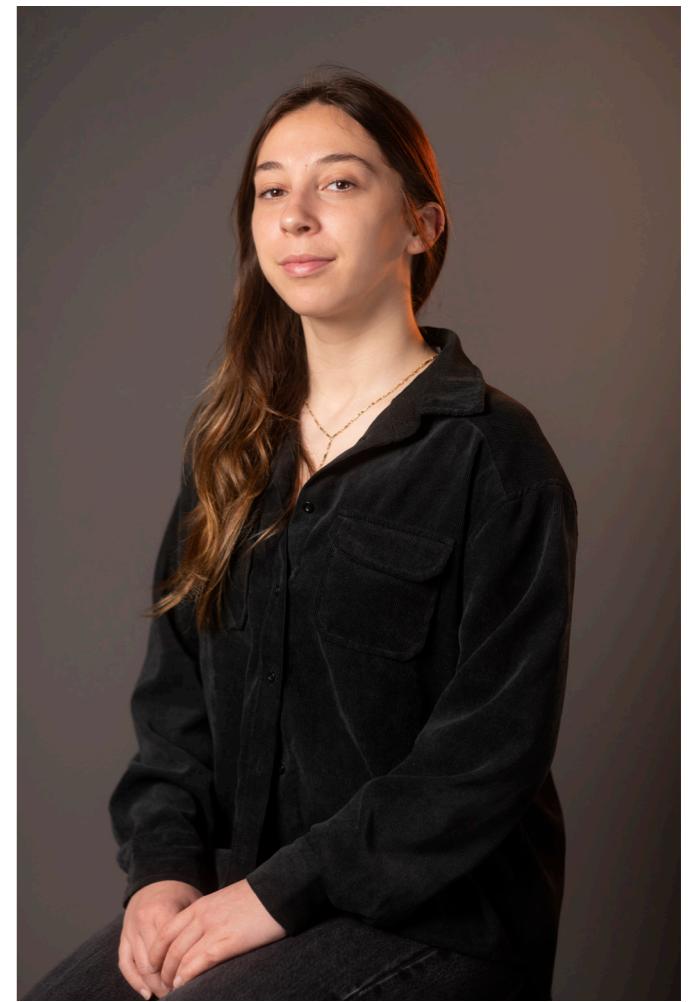
With the right white balance it creates the perfect light for natural skin tone color.



85mm 1/50s ISO800 f/2,5
Mittuniversitetet R Building Studio, 27 Apr 2023



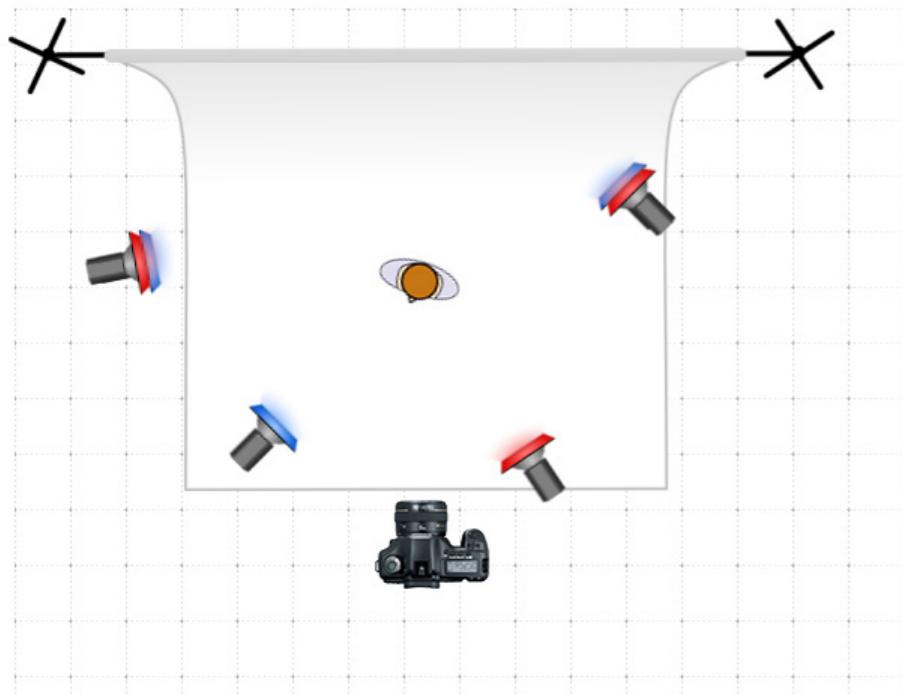
Neutral skin and warm highlight



In these photo's the keylight matches with the whitebalance while the backlight the opposite. For example:
Left Image.
A warm Key light with the same white balance around 3200 kelvin while the backlight is around 5600 kelvin.

Right image is reverse.

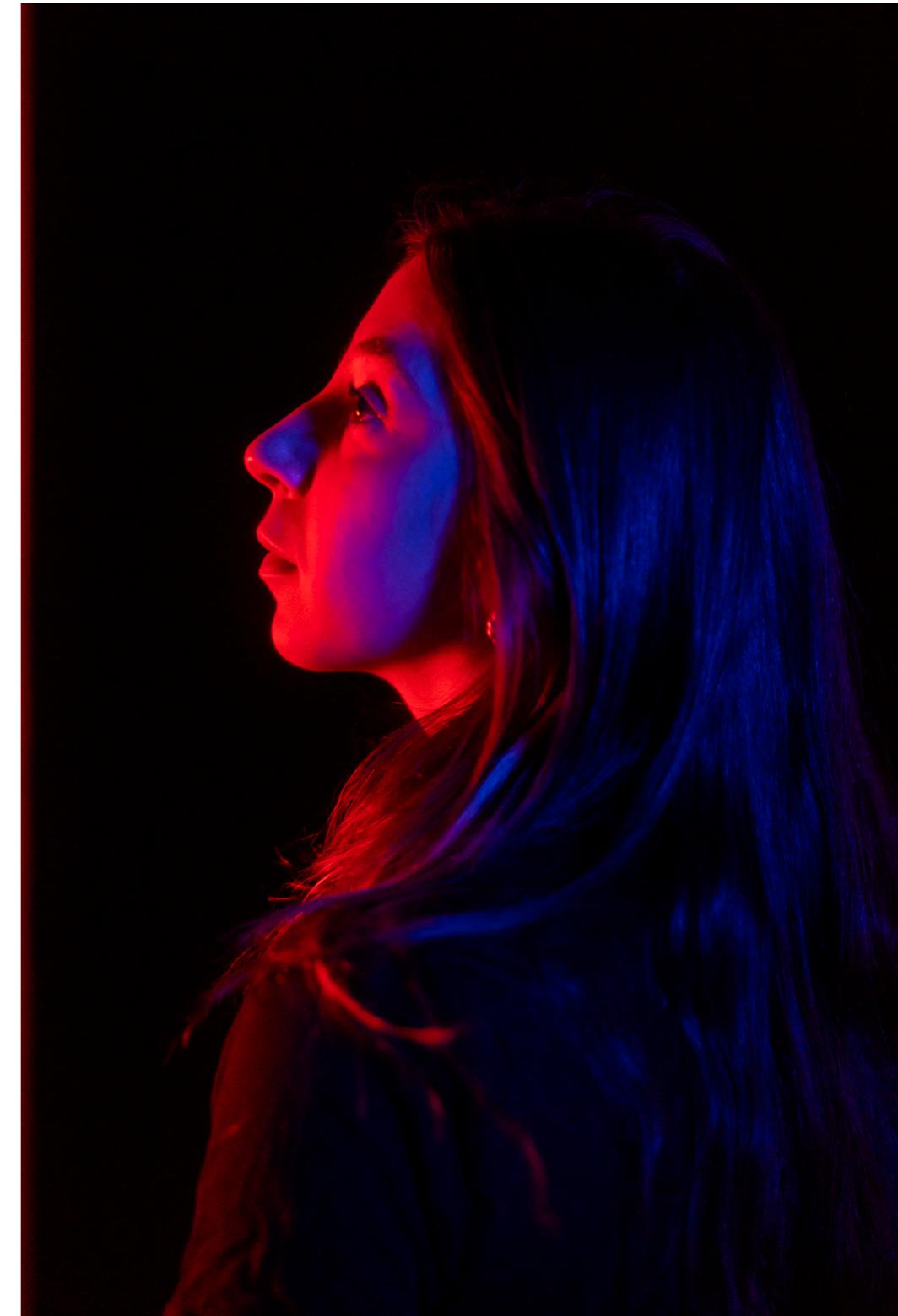
Colour freestyle



Reflection

Utilizing color gels and varying light positioning enables the creation of different styles in photography.

An important lesson I've learned is that adding multiple layers of gels reduces the intensity of the light. Therefore, stacking numerous gels will result in a less bright light output.



85mm 1/250s ISO1250 f/1,2
📍 Mittuniversitetet R Building Studio, 18 Apr 2023

Form



▲ King crab uramaki
85mm 1/10s ISO100 f/4
📍 Product photography box,
25 Jul 2021

Tips Product photography:

- Tip #1 - The right light, know when to use natural light over studio light.
- Tip #2 - Get inspired, Don't try to reinvent the wheel, use sites such as pinterest to see what's possible.
- Tip #3 - Props, Find items that can compliment and surround your subject without overwhelming it.
- Tip #4 - Shoot wide shoot close, take multiple perspectives of your subject.
- Tip #5 - How might a product suit someones interest or lifestyle. Try showing a product in use or in a way that appeals to target group.

◀ Reflection

The product photography box is a great tool for product photography.

But the only thing what limits me is the amount of space you have to work with. It can be very tedious. And the freedom of creativity is limited by the lights from above.

For more creativity a open studio would be better for example a product photography table.

Shape

Shape is a crucial element in an image, and it is best emphasized when the subject is either frontlit or backlit.

Front lighting can create a flat but attractive look, while strong contrast with the surroundings helps the shape stand out and be easily identifiable.

Shapes in images can also be represented as silhouettes.

Form

Form is the shape of an object in three dimensions.

Side lighting brings out the form by revealing its depth.

In photography, you can create a 3D effect by using the right lighting, angles, colors, and depth.

Try different subject positions to find shapes that emphasize the form. Use light to explore and emphasize the object's contours.



Materials

The texture of a material provides information about its tactile properties.

Regardless of their form, different materials reflect, absorb, and transmit light in various ways.

Matte objects typically appear smooth with minimal or no reflections, resulting in low contrast.

On the other hand, glossy objects reflect their

surroundings with higher contrast, showcasing stronger highlights.

Metals can exhibit both glossy and matte characteristics.

The gradation and reflection of light on metals convey their tone and properties.

Edge details often reveal the type of material and object being observed.

▲ Tamago nigiri
105mm 0,4s ISO100 f/10
📍 Product photography box,
12 Jul 2021

The light that illuminates these edge details is referred to as a specular highlight.

Reflection

For this shoot I used the fork and knife. Overall happy with the reflections of the cutlery.

Limited resources can present challenges when attempting to position objects in interesting compositions. To overcome this, it would be beneficial to create a more comprehensive plan for the next time or consider enlisting someone to assist with holding the objects in place.



▲ Fork and knife
110mm 1/6s ISO125 f/5,6
📍 Product photo studio
Mittuniversitetet R Building,
5 May 2023

Product photography

A product photo studio is just like a regular photo studio miniature.

There would be often be a still life shooting table. To keep highlights under control you might find product tents.

Product photos can be found in many sub-genres such as light, dark, dynamic, scenic, artistic, mixed media.

Shoot with your camera mounted on a tripod, to keep images sharp, shoot with a timer delay or a remote trigger.

Keep an eye on your focal length, To get a natural look try 50mm.

To create depth in a product photo utilise depth of field.

To create contrast in a product photo try backgrounds that create colour contrast and harmony.



▲ Digital devices
84mm 1/160s ISO1600 f/7,1
📍 Product photo studio
Mittuniversitetet R Building,
5 May 2023

Mock up



▲ Digital devices
84mm 1/160s ISO1600 f/7,1
📍 Product photo studio
Mittuniversitetet R Building,
5 May 2023

Reflection

In this shoot I focused on creating clean mockups of the iPhone 14 pro and the iPad screen. So I can use this later for my own personal projects.

What I have learned is that if you shot directly from above you'll see the reflection so I managed to find an angle which didn't

show any reflection. It was maybe better to use a white background to have a better contrast for subtracting the subject from the background.

Texture



Texture

The challenge of seeing and capturing texture is mostly based on one element light.

Texture can be accentuated by the side light of early sunny morning or early evenings. Or by overhead light when the sun is vertical and high in the sky.

Texture as background

can create an exciting and emotion filled composition.

Reflection

For the best details I used side lighting and the overhead softbox to achieve it.

Front lighting gives it a flat look. Too much light quantity will over expose certain parts.

▲ Chalkbag, Manny 8b+
110mm 1/6s ISO125 f/5,6
📍 Product photo studio
Mittuniversitetet R Building,
5 May 2023



Reflection

For this photograph I used a product photography box to get even lighting from all sides. Under the subject I placed a black acrylic plate to reflect the subject on it. You can really see the details and the texture of this subject very well.

The black contrast very well with the white flesh of the fish.

▲ Red seabass nigiri
105mm 1/30s ISO100 f/4
📍 Product photography box,
25 Jul 2021

Carbon steel



Reflection

This carbon steel sashimi knife is photographed in a product photography box.

The steel is well lighted and the sakura wood handle too.

Because of the zoom and the aperture everything is not in focus.

▲ Carbon steel sujihiki
105mm 1/30s ISO100 f/4
📍 Product photography box,
4 Jul 2021

Reflection

This carbon steel japanese chef's knife is photographed in a product photography box.

The steel is well lighted you can see a clear difference between the refined carbon steel and the unrefined part.

Because of the zoom and the aperture everything is not in focus.

▲ Carbon steel santoku
105mm 1/30s ISO250 f/5,6
📍 Product photography box,
4 Jul 2021

Conclusion

Photography is a highly subjective art form, offering numerous tools to aid in realizing your unique vision. Among these tools, light stands out as a crucial factor that can either make or break a photo.

We were taught to begin with ambient light and gradually introduce artificial light. This approach allowed us to truly comprehend the significant impact that flash and diffusers can have on the interplay between artificial and ambient light.

Studio lighting can feel overwhelming for beginners, but by starting with a single light setup and mastering the various styles it can produce, you can gradually progress to more complex techniques like three-point lighting.

Once you feel comfortable with studio lights, the realm of color opens up to you. This involves using gels to modify the lights or even replacing the studio lights with RGB lights, which introduces new challenges. However, the addition of color brings a whole new dimension and depth to your photographs.

Form is often considered the most challenging aspect, as it requires applying all the knowledge and skills acquired from previous learning experiences. When working with objects or subjects that possess reflective surfaces like metal or glass, extra caution is necessary. Attaining the desired form and capturing it successfully demands careful attention to detail.