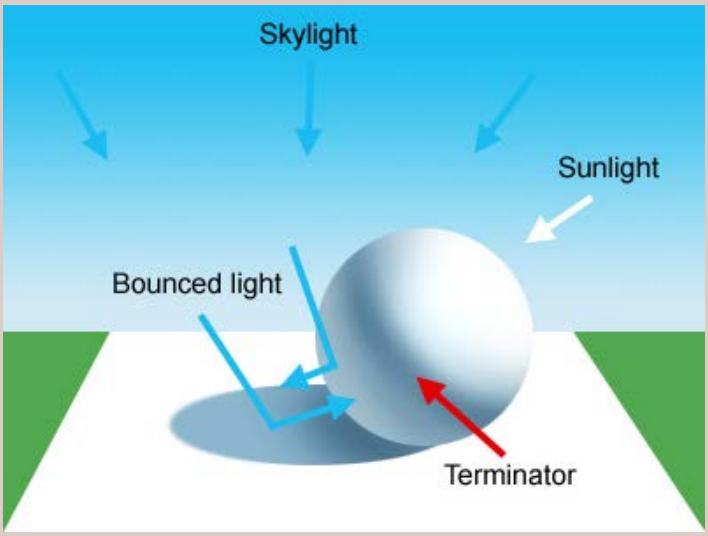
LIGHT - a detailed tutorial

PART 1: THE BASICS

Throughout this article I will be using a diagram of a white ball on white card to demonstrate how light behaves in different everyday situations:



Here it illustrates a sunny afternoon. The main source of light is the sun, whilst the blue sky supplies a second source of light with very different characteristics. Some light is also bouncing between the white base and the ball and supplies a third source of light.

The brightest light is coming from the sun and is white light emanating from a small source, which causes it to cast sharp edged shadows. The second source, the blue sky, is a very large light source and as a result has very soft shadows (which in any case are completely masked by the direct light coming from the sun). I will go into more detail later about light sources and shadow size, but for now just remember that the smaller the source of the light, the harder the shadows.

The light coming from the blue sky has a very strong colour cast which affects everything in

this scene. The shadow cast by the ball is blue because it is illuminated by blue skylight, since the ball is shielding it from the white light of the sun. The parts of the ball which aren't in direct sunlight also take on a blue hue because they are lit by the blue sky.

Finally the light that is reflected between the card and the ball is also predominantly blue (even though the card and ball are white) since it is blue skylight that is being reflected by the white objects. The surfaces which are closer together receive more of this reflected light than areas which are further apart, therefore the bottom part of the ball is lighter than the centre because it is nearer the white card.

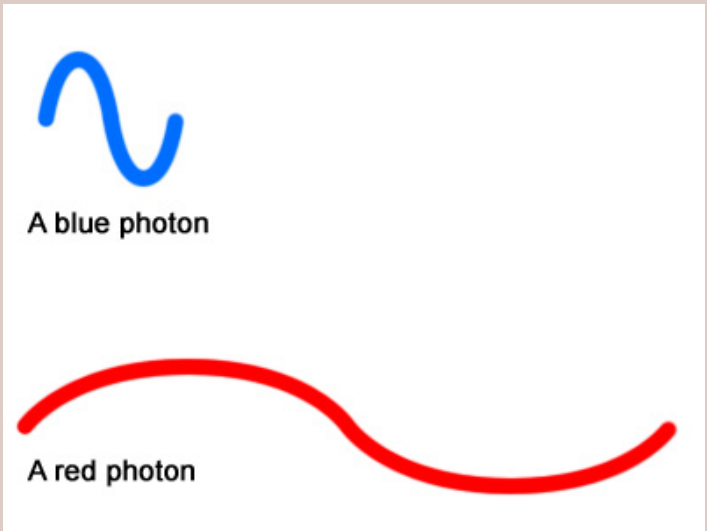
The darkest areas in the image are the base of the cast shadow and the border between the areas in sunlight and shade on the ball: this zone is called the terminator. The base of the cast shadow is very dark because it receives no sunlight and the ball is also masking it from most of the skylight and bounced light. The other end of the cast shadow is lighter because it is receiving more light from the sky and also bounced light from the ball.

Why is the terminator the darkest area on the ball?

Partly because of the effect of contrast, being so near to the very bright side of the ball in sunlight makes it appear to be darker, but also it is receiving less of the bounced light which is being reflected by the white card. So unlike the rest of the ball, which is receiving either full sunlight or light reflected from the white card, its main source of illumination is the blue sky. It is the area in between the main light (the sun) and the fill light (the reflected light from the card).

Why is the light from the sky blue?

Visible light is made up of tiny particles called photons, these particles have different wavelengths depending on their colour: blue light comprises of particles with shorter wavelengths whereas red light is made of particles with longer wavelengths.



White light from the sun is made up of a continuous spectrum of colours which, conventionally, is divided into the colours of the rainbow (with progressively longer wavelengths: violet, indigo, blue, green, yellow, orange and red). It is the mixture of these colours that produces

white.

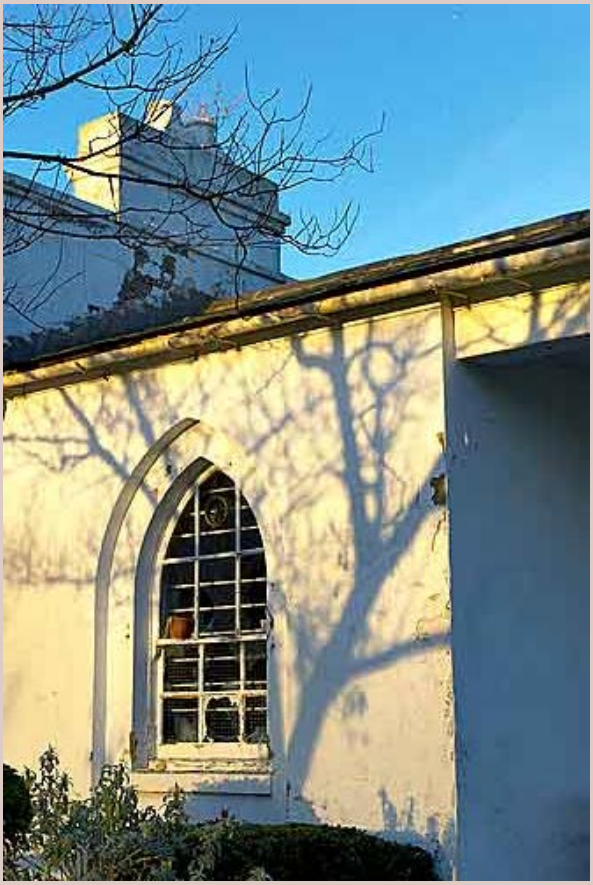
However what happens to light when it travels through the atmosphere of the earth is that the shorter wavelengths of light become scattered. Our atmosphere is made from various gases and the atoms and molecules that these are formed from are suspended within it. Photons travelling through the atmosphere physically collide with these atomic particles and a collision will deflect the photons and make them bounce in another direction. Shorter wavelengths are more likely to be deflected than longer ones, so that the photons which are scattered in all directions by these collisions are predominantly blue.

On a cloudless day blue light scattered by the earth's atmosphere shines on everything around us.

Longer wavelengths of light, such as red, can travel further through the atmosphere without being scattered. This is why sunsets are red: as the sunlight travels through a thicker layer of air to reach us when it is lower in the sky a lot of the blue light is lost from scattering, and the remaining light is predominantly red.

*The sun's light glows red at sunset because the shorter blue wavelengths have been lost due to scattering. *Note however that the scattered blue light is reflecting back from the eastern sky and acting as a fill on the foreground waves.*

The effect of bouncing blue photons in all directions is that the atmosphere is actually glowing with blue light, an effect which is clearly visible from space. This blue light is strong enough to illuminate areas that are not in direct sunlight, which is why you can still see when you are in open shade.



The shadows in this photo have a strong blue cast because they are being illuminated by the blue sky.

Light bounces

When light hits a surface it either bounces or is absorbed by it, depending on what colour that surface is. A white object will reflect all wavelengths equally, whereas a black object will absorb them all. When white light hits a red surface the blue and green wavelengths are absorbed and the red light is reflected (I'm just using the primary colours, rather than the full spectrum here, for the sake of simplicity).

So if white light hits a red surface the photons this surface reflects will be red. When these photons hit the next surface in their path they will therefore be illuminating it with red light. This phenomenon is called radiance, and the colours of adjacent objects will have an affect on each other because of this.

The light reflecting from this venetian blind is projecting the wood's colour onto the wall.

The rear abdomen of this bee has been strongly coloured by red light reflecting from the poppy.

Radiance is usually a subtle effect, and it takes a great deal of light for it to become apparent. In soft or dim light it may not be visible at all, however in bright light it can add a lot of colour to the objects it affects. If light is reflecting between objects of the same colour it can create a

very saturated effect as the bounced light reinforces the existing colour of the underlying surface, making the colour glow vividly - you can sometimes see this phenomenon in bright daylight.

As the light bounces between these wooden slats the colour of the wood is enhanced by the fact that light of the same colour is reflecting back onto it. The result is that the coloured light and the underlying surface combine to create a glowing and saturated version of the wood's existing colour.

High key and low key

How we choose to represent a scene is subjective and open to interpretation. Most situations will have a balance between light and shade that produces an average or medium grey because that's what we perceive as normal. However there are some situations where the natural order of things tends towards either extreme of light or dark, such as fog or snow on the one hand, or night time on the other. Alternatively an artist might choose to emphasise one of these extremes for visual impact, or to convey a specific feeling.

High key

High key images have a predominance of white or very light tones and tend to look light and airy. High key lighting is often (but not always) soft, and detail is generally low. In nature high key lighting is found in fog and snow, where even shadows are light due to the amount of reflected light bouncing around.

The stark simplicity of this photograph is created by the very limited palette it uses: white and some dark greys and blacks.

Low key

Low key images have by their very nature very little light in them. Contrast is usually high and the lighting hard. Low key lighting can create a very moody atmosphere and is often used to this effect. The most obvious setting for low key lighting is night time, but it can also be found in other situations such as storms and in interiors.

The drama of this image is emphasised by the low key lighting.

White balance

Most light sources that we encounter in everyday situations have a colour cast, however our brain is very good at filtering this out. As long as there is a vague mixture of the three primaries in the light our brain interprets it as white. Even under lighting with very strong colour we have the ability to filter the information our eyes receives and make sense of the colours so that we perceive them in a relative rather than absolute manner.

The most obvious way of demonstrating this is to use a digital camera with the white balance set to daylight: this is a neutral setting which will reflect the colours that are actually there. In the example below I have shot the image with a window acting as the light source. The light is coming indirectly from an overcast sky and is relatively neutral.

In the next photograph I have closed the blinds and used a standard household 60 watt lightbulb as my light source:

The strength of the colour cast in this image may well have surprised you, since we don't tend to perceive tungsten lighting as being such a bright yellow/orange. Our brain converts the colours to make them resemble the first image, but in this case it's the camera which is painting the true picture.

One very easy way of confirming this fact is to look at windows from the outside: next time you are outdoors during the evening look at the colour that comes from houses and you will see that their interiors are a bright orange. When we aren't directly under the light source we are able to see its true colour.

Viewing tungsten lighting from outdoors helps to reveal its true colour, from here it looks

bright orange.

Something very similar happens when we are standing in open shade, where the light is very blue. We perceive the light as being neutral, but if we step back and look at the shade from under sunlight the blue cast is much easier to see. There are many other situations where lights have a strong cast: fluorescent light is often green, street lighting very deep orange, evening sunlight progresses from a light yellow to a deep red etc...

From within open shade we perceive the light as being neutral, but stepping back reveals it to be a deep shade of blue.

3 point lighting and why it sucks

3d textbooks often describe the classic 3 point lighting set up and encourage beginners to use this as an effective way of lighting their scenes. It was originally developed as a way of lighting photographs and its one benefit is that it is easy to learn and understand. It comprises of a bright main light coming from one side, and dim fill light coming from the opposite side and a back light behind the subject which is used to pick out edges and highlight form.

The biggest problem with this set-up is that it is artificial and doesn't reflect reality. The use of back lighting especially should only be considered if you are looking for a specific effect since it is so dramatic and recognisable. Back lighting can be very effective but it should be used with flair rather than blindly applied to every situation. The kind of light that 3 point lighting creates simply does not exist in nature and therefore it looks fake. The fact that it is taught in so many textbooks also lends it an air of cliché and it has therefore become tired and boring.

It has long since fallen out of favour with photographers and film-makers anyway, so you will rarely see it in product shots or mainstream films. If you are looking to light an environment or an object it is far better to try and put some of your own creative thought into your lighting and study what happens in nature to then devise your own solution.

Everyone has seen those cheesy photographic studio portraits that rely on formulaic lighting: they all look exactly the same as each other because the photographer uses the same lighting every time. The result is a boring and lifeless photograph, if you want your own art to avoid cliché and be cheese-free then avoid textbook formulas and think for yourself.

Go to part 2: Light direction

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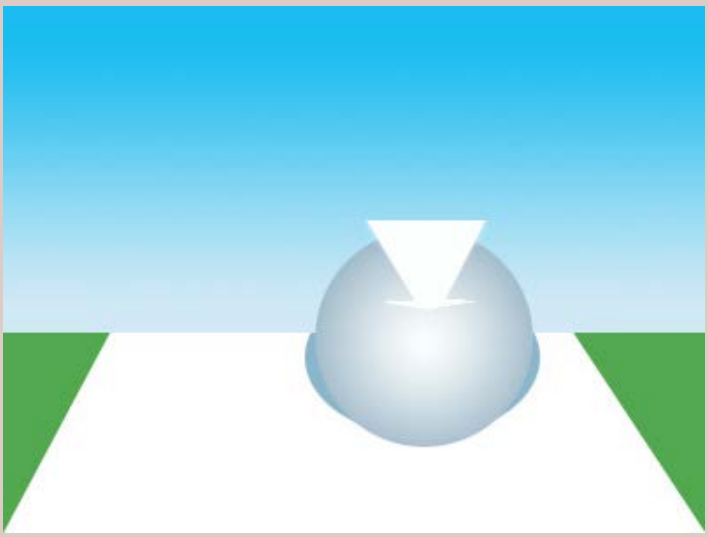
Part 1 Part 2 Part 3 Part 4

LIGHT

PART 2: Light direction

The direction that we view a light source from has a profound effect on our perception of it, and on how the objects in a scene will appear. Choosing which direction your main light is coming from is one of the most important decisions you can make since it will have a great deal of impact on how a scene will appear, and also on the emotions your image will convey.

Front lighting:



This is where the light source is directly behind the viewer's point of view. It is most commonly seen in flash photography and is often fairly unappealing if the light source is hard - there are exceptions and in some situations very attractive images can come from soft frontal lighting.

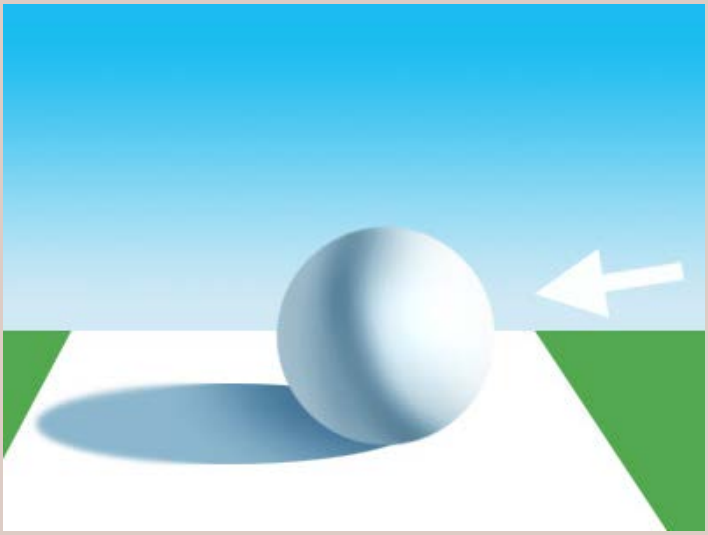
Front lighting does little to reveal form or texture since the shadows are mostly hidden from view, as a result it can make things look flat. However soft diffused frontal lighting can also be quite flattering to some subjects for this very reason - it can help conceal wrinkles and blemishes and so is quite often used in portrait and product photography.

Hard frontal lighting has that paparazzi look: harsh and often unattractive.

Soft frontal lighting smooths over form.

Front lighting can make a scene look flat since it isn't good at revealing form and texture.

Side Lighting:



Side lighting is very good for showing form and texture and lends a three-dimensional quality to objects. Shadows are prominent and contrast can be high as a result. Side lighting can be used to throw dramatic shadows onto surfaces such as walls and create atmosphere. Side lighting is generally attractive and is often used to great effect: it is the kind of lighting encountered at the beginning and end of the day and as such is often seen in films and photographs.

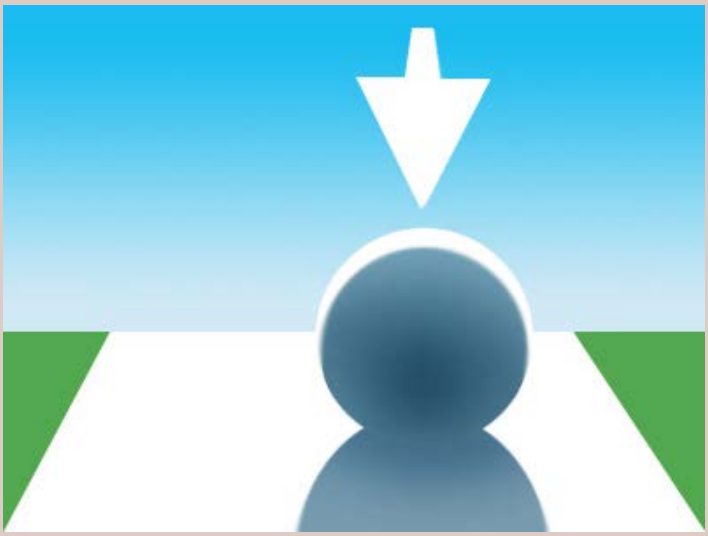
Potential drawbacks of using side lighting are that areas of the image can be lost in shadow, and it can reveal imperfections such as wrinkles. In portrait photography for instance it is generally used on men rather than women because it can look quite harsh, especially if the shadows aren't soft edged.

Side lighting can be used to great effect to reveal form and texture.

The texture of this wall is revealed by the light of the evening sun raking across it.

The long shadows cast across this image help to give it a sense of depth and dimension.

Back lighting:



Back lighting is where the viewer is looking into the light source, and objects will have their lit sides facing away from us to appear either as silhouettes or darkly lit by the fill light. It is usually a high contrast situation and can often look very atmospheric and dramatic. If the light source is at a slight angle relative to our point of view objects will have a rim of light defining one or more of their edges, the harder the light the more pronounced this rim will be.

Backlit scenes usually contain a lot of shadow unless the light source is very soft. Most of the

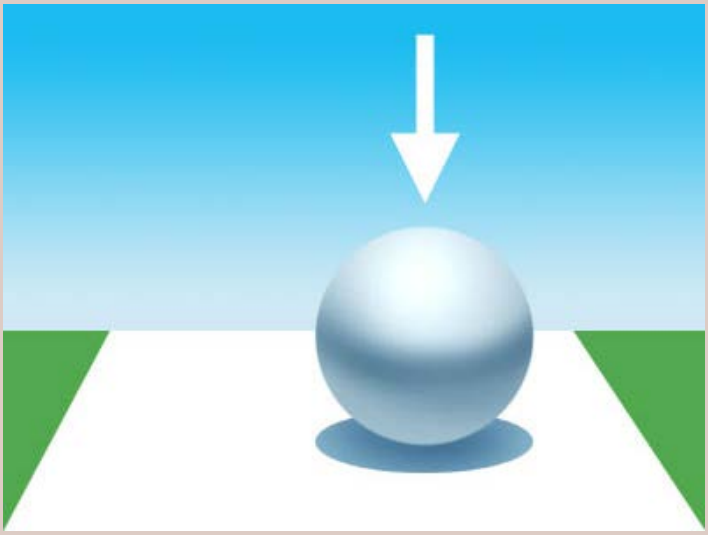
time the image will be predominantly dark with dramatic pools of light. The rim lighting that occurs in this situation can be very useful for defining forms among the shadows. Another feature of this kind of light is that it reveals transparency, translucency and any fine detail or texture along rim-lit edges. This kind of light is very effective for lending drama to an image.

Back lighting can make even the most mundane subjects look appealing.

It is also a very effective way of revealing translucency.

Silhouettes are a common feature of backlit scenes.

Lighting from above:



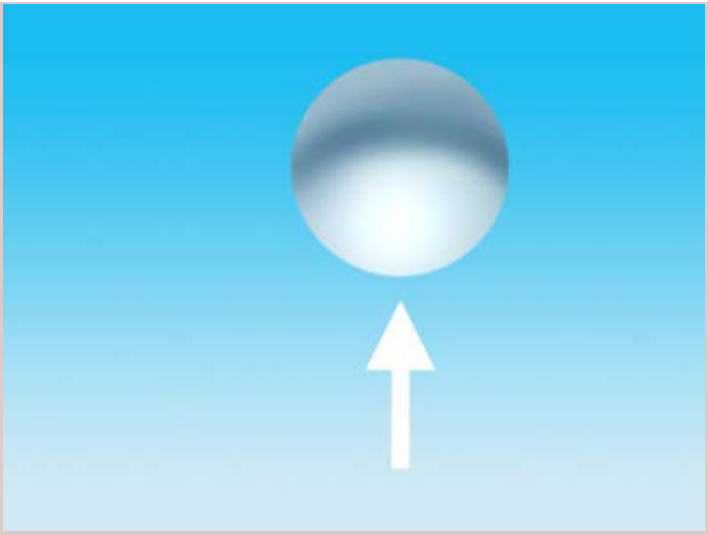
Top lighting is a slightly more unusual situation, although it is common in overcast daylight. It can also be encountered in sunshine at midday, in some interiors and in other situations such as stage lighting. In soft light it is an effective way of showing form. Under hard light it can lend an air of mystery by casting dramatic shadows which conceal most of the forms beneath them: for instance people directly underneath hard lights will have black holes for eyes since their eye sockets will be in total shadow.

To my knowledge top lighting is rarely used by artists, however that's not to say it shouldn't be used. For overcast daylight it is the most realistic set-up, with the whole sky acting as a large diffused light source. It's also an unusual lighting solution for more atmospheric situations and the very fact that it's not often seen can be used to create an uncomfortable feeling.

Soft light from above is a feature of overcast weather.

Lighting a figure from straight above can give a broody and menacing look. It emphasises bone structure and the depth of the eye sockets.

Lighting from below:



If lighting from directly above is rare, then doing so from directly below is even more unusual. In a natural context this might happen if someone is standing over a campfire, or holding a torch. Reflected light can also come from below, from water for instance. It would definitely lend a strange appearance to even the most familiar things since what is usually seen in light and shade would be reversed (think of a person shining a torch onto their face from below: the shadows appear to be upside down).

Again, the very rarity of this kind of lighting can be used to creative effect. We instinctively recognise things that don't seem right, and this can be used to create specific moods by manipulating the lighting to convey emotions and responses.

Lighting from below is rarely seen, but can be used to create unusual images.

Lighting a figure from below creates a spooky and unfamiliar look, even the highlights in the eyes look strange because of their placement. Notice how the angle of the light also emphasises the texture of the skin. Compare it to the image in the previous section: it is the same face, only the position of the light has been moved, yet they look completely different from each other.

Go to part 3: Natural light

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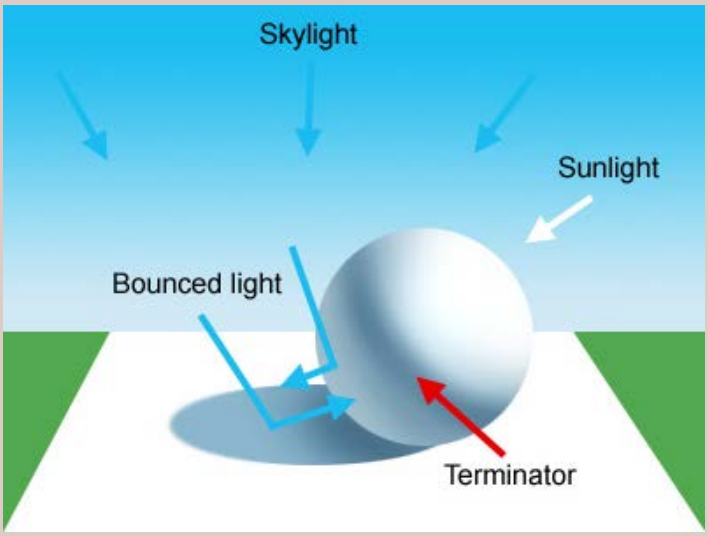
LIGHT

PART 3: Natural light

Natural light comes in a wide range of different flavours, and the difference between them can be enormous. The source of all our natural light is the sun, however it takes on different characteristics at different times of day and in different weather conditions, turning this one source of light into essentially many different ones ranging from hard and warm to soft and cool.

Basic sunshine is essentially described in the diagram in Part 1, this being what most of us would imagine as a normal bright and sunny day.



This image represents sunlight at mid-morning or mid-afternoon, and it probably the most straightforward kind of light the sun gives in terms of colour and character. However there are two major factors that affect the character of sunlight: scattering and cloud cover.

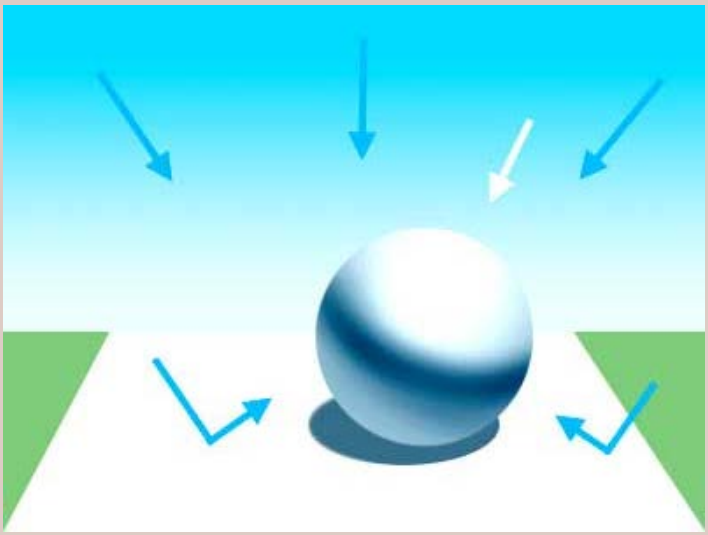
As discussed in part 1, the earth's atmosphere scatters the shorter wavelengths of light which has the effect of creating the blue sky and of reddening the light from the sun itself. The more air that sunlight has to travel through, the more scattering occurs. This means that as the sun gets lower in the sky it has to travel through a thicker layer of atmosphere, thus causing more scattering at the beginning and the end of the day.

Obviously this means that sunlight has very a different character at different times of day. There are also the special conditions that occur when the sun is below the horizon, when skylight scattered from the sun is the only source of light.

Clouds also have a major impact on both the colour and the character of sunlight. Clouds are translucent, which means that they let light pass through them, but in a diffuse manner. When light travels through a transparent surface such as glass the rays remain parallel, however what happens in a translucent surface is that as the light travels through it is deflected by the substance and the rays bounce around inside it and emerge from it in several directions. This is a similar phenomenon to the scattering of blue light by the atmosphere, except that in clouds it occurs across all wavelengths of light, not just the shorter ones.

The effect that this diffusion has on sunlight is to soften it, turning a small hard light source (the sun) into a large and soft one (the whole sky). Colour is also profoundly affected by cloud cover, since clouds conceal the blue sky and the light coming from it.

Midday sunshine



When the sun is at its highest point in the sky the light is at its whitest and strongest. Contrast is very high, shadows are very dark, so dark in fact that film emulsions generally render them black - although with the naked eye it can still be possible to see some detail in the shadows. For this kind of lighting to be believably recreated it needs to be very strong and high contrast.

The strong light has the effect of bleaching out colours and these appear to be less saturated than at other times of the day. The strong contrast can make it difficult to create appealing images in this sort of light, however in situations where contrast is naturally lower it can work very well. Water for example can really benefit from this strong light, and many images of tropical seas are taken at midday. In other cases the high contrast can be used to creative effect.

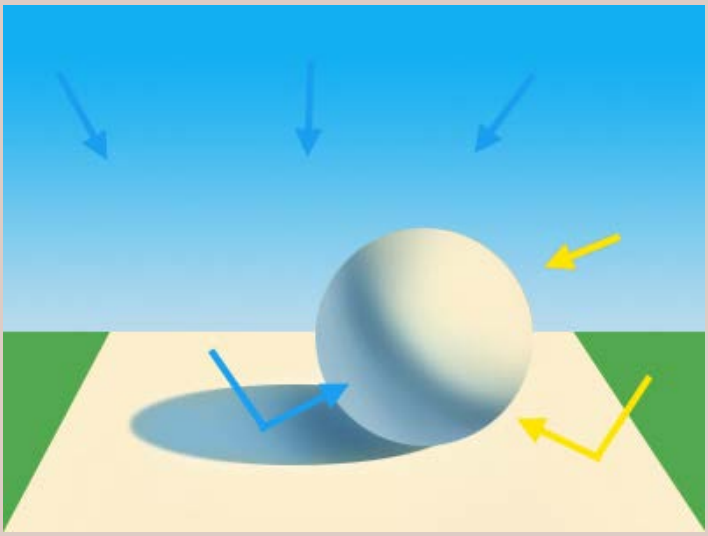
The small shadows and strong light aren't particularly revealing of form, and the low saturation is another drawback. Most photographers avoid using strong midday light, however that doesn't mean these conditions are impossible. As with most things going against conventional wisdom can lead to unusual and creative solutions.

This image is typical of midday lighting, notice how the foreground sand is totally white and the shadow is jet-black. The contrast is too high for the film to be able to reproduce the full range of shades.

Water photographs well at midday because the sunlight is at a good angle to avoid reflecting towards us. Unlike with most other subjects this kind of light brings out the colour in the ocean very effectively.

This photograph makes use of the strong contrast of the midday sun to emphasise the contrast inherent in the scene. Using an infrared filter has heightened this effect further, in colour the image would probably not have been so appealing.

Late afternoon / early evening



As the sun goes down its light gets progressively warmer, so that by the evening sunlight has very obvious yellow cast to it. The colour of the sky also takes on a deeper shade of blue due to the decreasing light levels.

Evening light is generally considered to be very attractive, the warm colours and softer contrast are very easy on the eye. From about an hour before sunset this effect is at its most noticeable - photographers and film makers call this the golden hour because the light takes on very photogenic qualities.

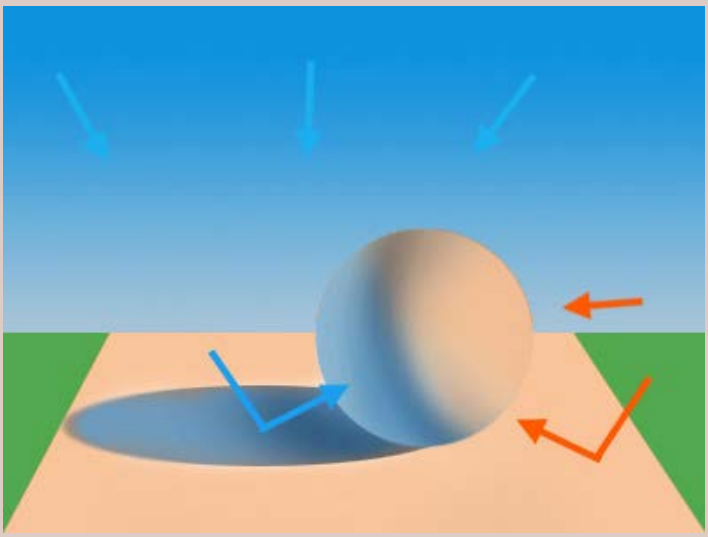
Colour saturation at this time is very high and the colour of the light itself has a huge effect on our perception of the surfaces it touches, lending them a warm and rich appearance. By an aesthetically pleasing coincidence the shadows are near to the complimentary colour of the highlights (yellow against blue), and the main light is a warm yellow while the shadows are a cool blue. These pleasing properties mean that evening light often seen in photographs, films and adverts.

You can clearly see the strong yellow cast of the evening sun on the chimneys of Battersea Power Station in this photograph.

Here the glossy coat of this dog beautifully reflects the yellow evening light on one side and the blue sky on the other.

Evening light is attractive enough to give a pleasing glow to almost any subject, this photograph would be very boring without the pleasing light.

Sunset



By the time the sun is about to set it has become a deep orange or red colour, and its light has also become much weaker which means that by now contrast is very low. The weaker sunlight also means that skylight takes on a greater importance and shadow areas become a deeper and richer shade of blue. Shadows at sunset are very long, and texture is very apparent.

The sky at sunset can be incredibly colourful if there are any clouds - and unlike the rest of the day the clouds are now lit from below, and take on dramatic red or orange hues. These colours add some complexity to the colour of the skylight and as a result can affect the colour in shadow areas, sometimes turning them purple or pink.

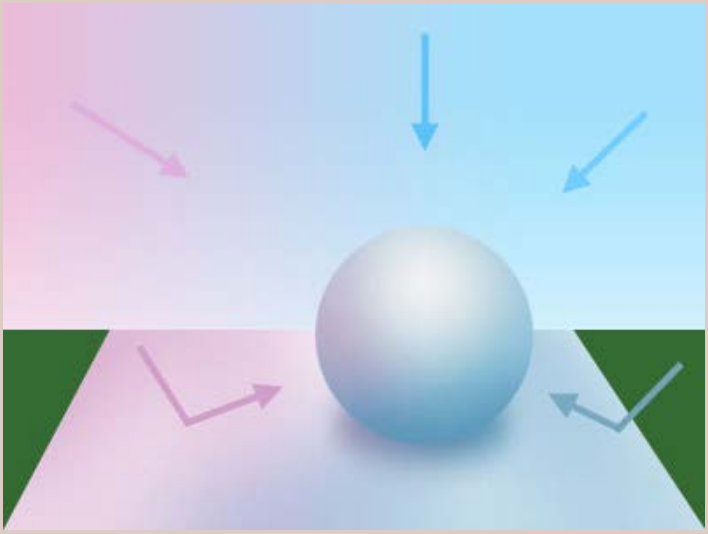
Sunsets are also very varied in terms of colour and atmosphere, a fact that is easily confirmed if you observe several sunsets in succession, no to will be the same.

Here the light of the setting sun is a deep orange, with the shadows turning purple from the mixture of colours in the sky.

Contrast is very low, and here the light of the sun and that of the sky are very close in intensity as they shine on these rocks.

Sunsets are quite short and the light changes very fast, a scene like this will only last for a couple of minutes before the sun disappears below the horizon.

Dusk



Dusk is a very special time of day with unpredictable but often very beautiful lighting. Since the sun is no longer above the horizon the sky itself is the only source of natural light. As a result the light is very soft, with little shadow and contrast and the colours can be very delicate.

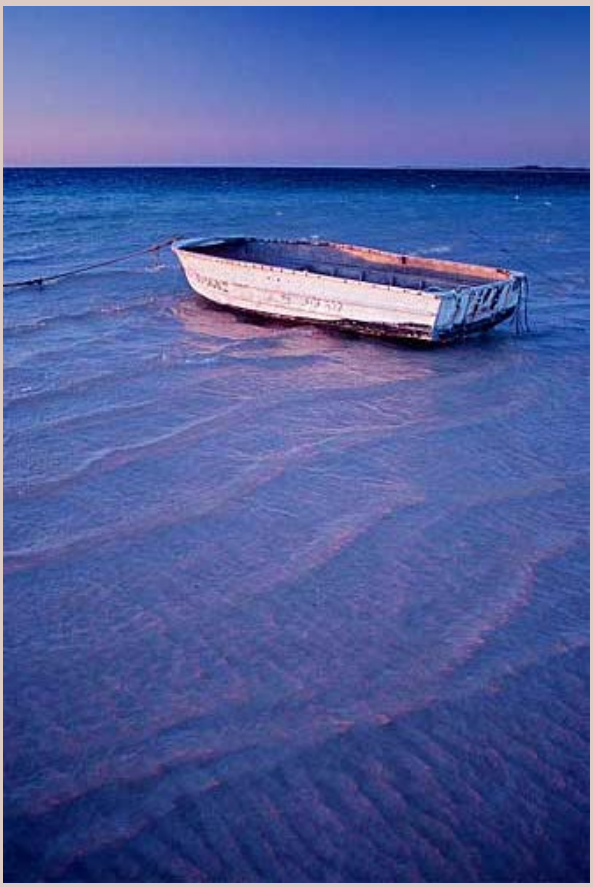
After sunset on a clear day there is often a pink area in the eastern sky, a phenomenon called alpenglow, which occurs very often but can surprise those who aren't used to noticing it. Alpenglow can cast a very noticeable pink light onto surfaces that are reflective, such as white houses, sand or water. This pink light is too faint to affect darker surfaces such as foliage though, so often the land can look very dark at this time.

However alpenglow isn't a guaranteed feature of the sky at dusk, at other times the eastern sky is just blue. There is always a yellow or orange glow to the west where the sun is illuminating the sky from below the horizon. The glow from the sun can last for over an hour after sunset, although the colour in the eastern sky is much shorter lived, and changes very fast. It is worth noting that the western sky can also be pink, as well as yellow, orange or red.

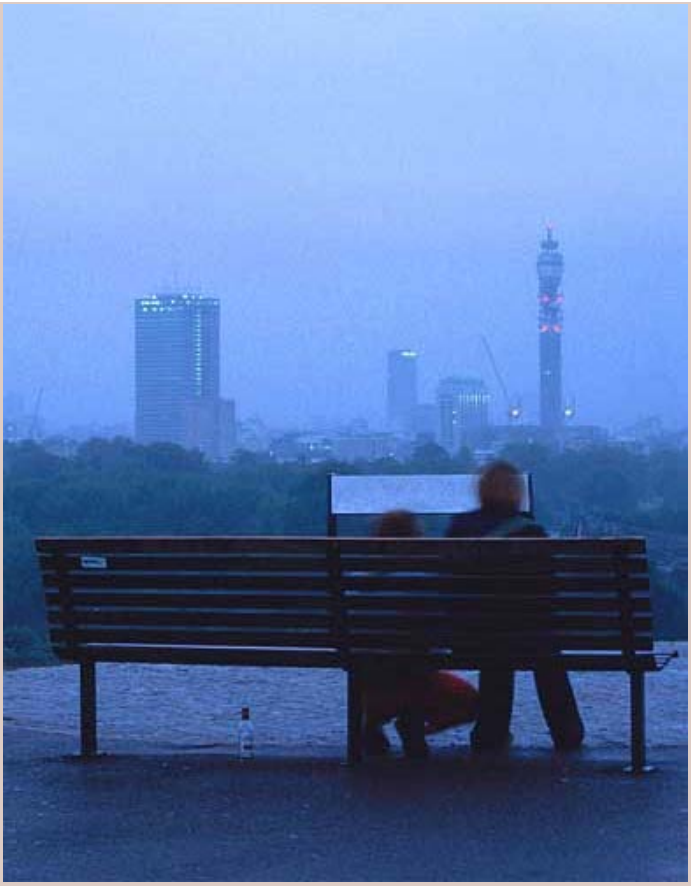
From indoors the sky can look a very deep and vivid blue at dusk, especially as it contrasts with the orange tungsten lighting found in household lamps.

In overcast conditions the skylight is always blue (clear skies are needed for the pink light) and it is generally much darker, with night falling much more quickly.

The pink eastern sky is very obvious in this image - you may not notice it very often but this colour is very common in the sky after sunset. Notice how dark non-reflective surfaces such as foliage become, whereas more reflective surfaces such as the cranes sill look quite light.

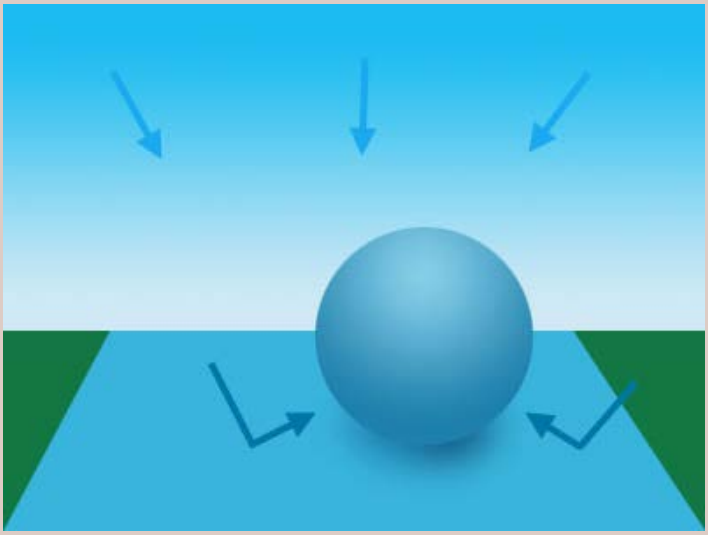


Here the very delicate dusk skylight is reflecting pink and blue from the water and the boat.



In overcast weather dusk light is a deep, saturated blue.

Open Shade



In open shade the sky becomes the main source of illumination, and as a result the light has a strong blue cast. The light from the sky is very diffuse with soft shadows. Without the atmosphere to scatter light there would be no illumination here, if you were to stand in a shady area on the moon for instance it would be pitch black.

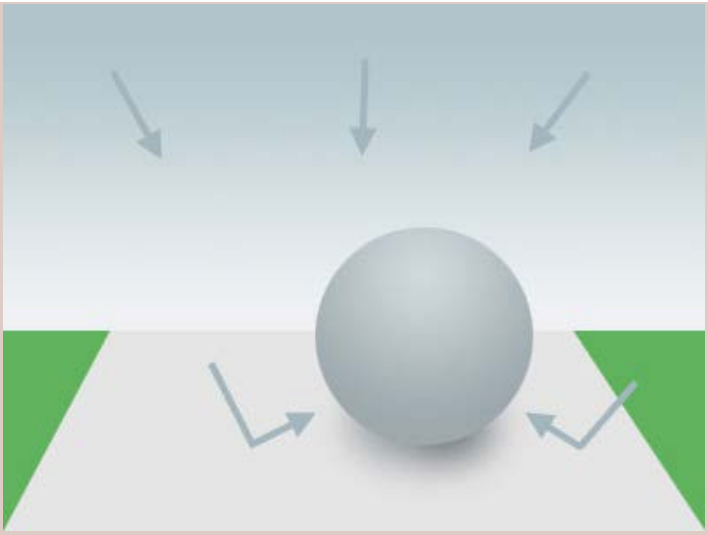
Light in open shade can also be reflected from the environment, nearby walls for instance. Foliage and other surfaces can also reflect light into shady areas, with resulting effects on the colour of the light. If you stand in a dense forest where the sky is hidden but leaves are reflecting light then the colour of the light will be green, the same effect can be seen between

trees and grass.

The strong blue cast of open shade is clearly visible on these steps. Despite the fact the light is very diffuse you can see it still has a strong direction and is coming mostly from above, the other directions being hidden by walls.

This plant is very obviously in the blue diffuse light that is found in open shade.

Overcast



Overcast light comes in a few varieties, depending on the thickness of the cloud and the time of day. Contrary to popular opinion it can actually be quite beautiful and it does have quite a few attractive qualities. Since the whole sky is acting as one light source the light is soft and diffuse, with very soft shadows. Contrast is low and colour saturation is usually quite high.

Colour is dependent mostly on time of day. I've seen colour temperature charts that claim overcast daylight is blue, and the thicker the cloud the deeper the blue - however my own findings are quite different from this. If the sun is high the light appears to be white or grey to me, and the thicker the cloud the whiter the light. It's only when the sun gets lower in the sky that overcast light becomes bluer, and the lower the sun goes the more obvious this becomes.

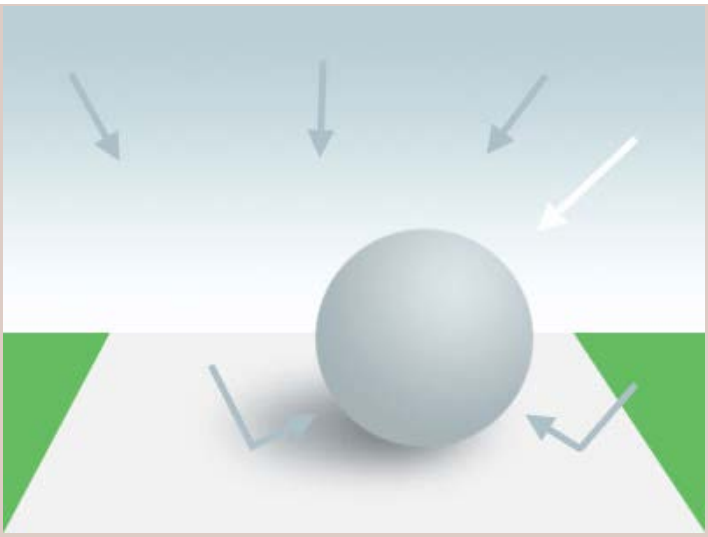
Overcast light is often perceived as being boring, but it can be beautiful too. Because it is very soft it is very flattering, and it can be used to great effect to show colour and texture. Reflective surfaces can also look very appealing in this kind of light as the white sky creates broad and soft reflections of itself, this is most often seen in water but other surfaces such as the metal on cars also exhibit this.

Because of the low contrast and relative neutrality of overcast light colours can appear very saturated. Notice the large soft highlights in the red leaves created by the reflection of the sky. On a sunny day these highlights would be much smaller and harsher.

The diffuse light from the sky shows the form of these grapes but the contrast is soft enough that very little is lost in total shadow. Again the colours are very saturated.

The overcast sky creates beautiful silvery reflections in water. One of the secrets in getting good images on overcast days is to keep the sky itself out of the picture.

Bright overcast



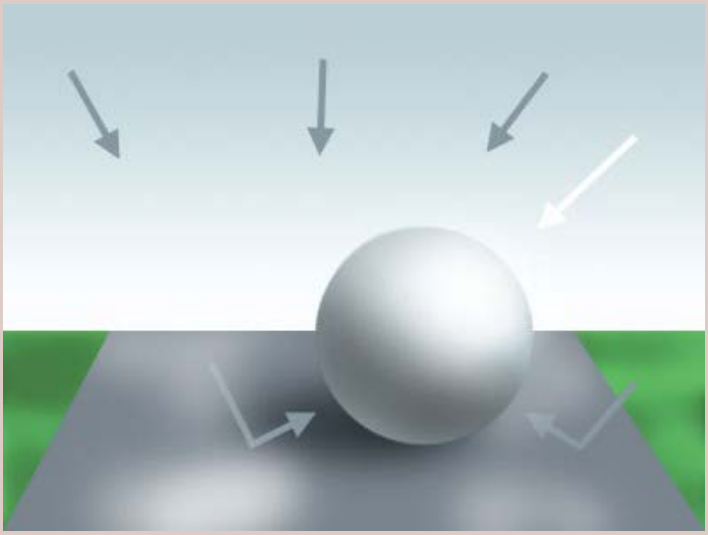
On days with thinner cloud it is possible to get a little directional sunlight coming through, which creates stronger shadows which can still be soft as long as there is cloud in front of the sun. Bright overcast is an almost ideal compromise between the strong contrast of sunshine and the relative dullness of heavy cloud.

On days with thinner cloud cover the sky can have a lot of texture, whereas on days with heavy cloud it tends to look a solid white or grey. Varying cloud thickness or small gaps between clouds can also help to introduce colour into the sky, with blue skylight and yellow sunlight reflecting onto the surface of the clouds. Colours in the sky can vary enormously when cloud is thinner, and the sky can often be very striking with thin or broken cloud. Another factor influencing cloud colour is that distant clouds can appear yellow or even orange because of light scattering, even in the middle of the day.

Bright overcast light has a stronger sense of direction than the more diffuse light from heavy cloud cover, but shadows are still filled in by the surrounding cloud.

Here the stronger light from the sky is bright enough to outline the meerkat but the shadow beneath him is still soft because the sunlight is being diffused by cloud. Notice also how there is no blue in the shadows since there is no blue sky.

Broken cloud, stormy light, dappled light



It is also quite common to come across mixtures of light and shade in natural environments, I have grouped these together although they have quite different characteristics.

With broken cloud you get a different sort of light to pure sunshine or overcast because the blue fill light from the sky is absent yet the sun can shine brightly if there is a gap in the cloud. Clouds will cast visible shadows on the landscape and there will be patches of sunlight in between these shadows. Contrast can be high, and the grey skies are a dramatic backdrop to surfaces in sunshine, with the difference between the bright light and the gloomy background creating interesting juxtapositions.

Again skies in this light can be very colourful, with many factors influencing the colours: time of day, thickness of the cloud, gaps between the clouds, distance etc… Colours can range from many shades of blue through yellows, oranges and greys. Light can change very fast as the clouds move across the sky, with sunlight appearing and disappearing from moment to moment.

Dappled light, such as that found under trees in sunshine, is another mixture of light and

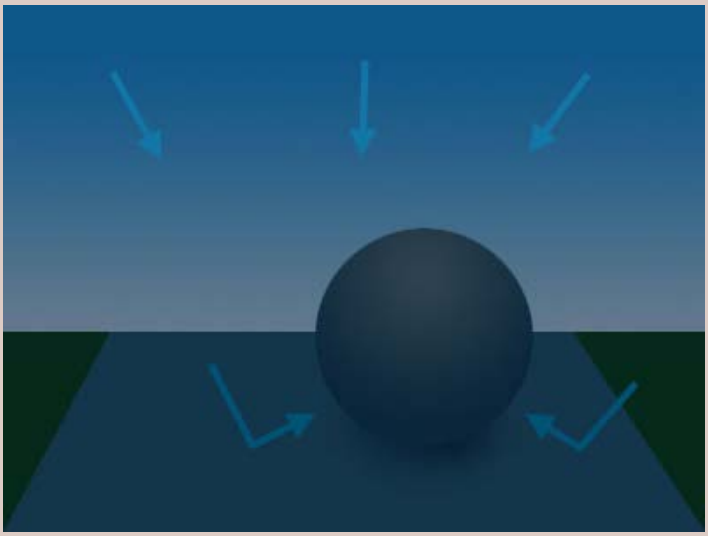
shade commonly found in nature. It is a high contrast light, in full sunlight dappled light can be very bright indeed in contrast to the shade around it. Most cameras will not be able to capture the full range of tones that exist in dappled light, although with the naked eye you may be able to.

The highlights in dappled light are very bright, turning to pure white in parts of this photo.

Here again the camera can barely handle the range of contrast this lighting provides.

Sunlight against a dark cloudy backdrop provides a dramatic mood.

Night



Although the sun is no longer in the sky at night, the sky itself generally still has some light in it. This light might come from sunlight being scattered through the atmosphere, or moonlight. Stars are too faint to cast any noticeable light.

The key point to remember about lighting a night scene is that the sky will always be lighter than the land - unless of course there is artificial light on the landscape. Take a look at the images below, the one on the left is the correct one, the one on the right is a physical impossibility because the light on the landscape would be coming from nowhere:

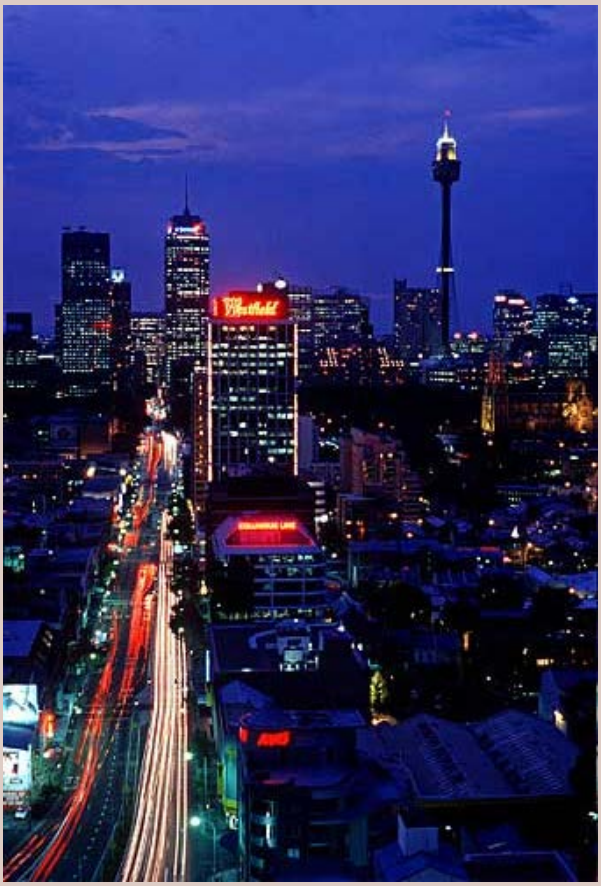
If the moon is visible then remember that moonlight is really just reflected sunlight and obeys the same rules that sunlight does. When the moon is near the horizon it has a red or yellow colour, but as gets higher in the sky it becomes whiter. The surface of the moon is practically colourless, being shades of grey - if you like at photographs of the moon landings they could look as if they were taken in black and white until you see colour on the astronauts.

Light from the sky is obviously diffuse and soft, however if there is any moonlight it will be hard, just like the sun. The main difference with sunlight is that it is obviously much fainter, so the ratio between the hard moonlight and the soft skylight will be different than in daylight. Another thing you should be aware of is that the moon is quite small when you look at it with the naked eye, it can often be tempting to make it much larger than it appears in real life.

In terms of colour, our eyes have very little colour sense in the dark so our perception of night is colourless. However film emulsions are still sensitive to colour at night, in fact you can expose a photo at night that will look like it was taken in the daytime if you leave the shutter open for long enough. Even short exposures at night have a lot of colour in them (far more than the naked eye can perceive).

In film making the classic way of shooting night time scenes is to shoot in daylight but underexpose and use a strong blue filter on the camera lens to create the illusion of night.

Another factor to consider with night scenes is light pollution. In England no matter where you are (even in the countryside miles away from any town) you can always see city lights glowing in the sky somewhere or reflecting back down off clouds with an unmistakable orange glow. You have to go to some very remote places to avoid this in the modern world.



Where there is no artificial light the landscape elements are very dark compared to the sky. Notice too how the roofs in the foreground are still reflecting skylight, despite the darkness.

Notice the lightness and colour in the sky, in photographs the colour is stronger than it looks to the naked eye.

Here the moon has a slight red or brown cast because it was low in the sky when the picture was taken. At its zenith the moon is white and grey.

Colour in the sky

The sky is often very colourful, if you look at it every day it can produce amazing and complex ranges of different colours. Many factors will influence the colours you see in the sky or in clouds. As well as time of day and cloud cover, the thickness of the clouds is important as well as the space between them. If the cloud is of uneven thickness, of if there are small gaps in between closely spaced clouds you will get variation in the amount, colour and quality of the light in the sky. This creates texture and a great deal of unpredictable variation.

Natural light, and the sky in particular, almost always has some colour, even on the bleakest day. And the sky is a constant diffuse light source during the day, no matter how bright or dim the sun is.

I've no idea what's caused the distant rain to look pink, it could be because the evening sun is behind it. The sky is always changing and unpredictable.

Volume

Light also interacts with our atmosphere if there are any particles suspended within that reflect or scatter light. Particles of dust, water or pollutants catch light and give a sense of volume, creating sunrays, haze or fog.

Haze is almost always present in the air, and it is what causes the perception of aerial perspective. Things that are further away from us are obscured by haze and look fainter, bluer and lower in contrast because the light reflecting from them has been slightly diffused by haze.

Fog is very similar to haze, only thicker. It diffuses light a great deal and if you find yourself in thick fog the light becomes so scattered that it has equal strength from all directions. When taking photos in thick fog a camera meter can give the exact same reading whether you point it up, down or to one side.

Haze is generally white or light blue, depending on the weather: usually it is blue in sunshine (because it's reflecting the sky) and white if it's cloudy. Fog is white (like clouds) but can also take on any colours that might be shining on it from the sky or the sun, so in practice it can look blue or even yellow or orange.

Sunbeams coming through clouds like this are caused by particles in the atmosphere catching the light.

This ground fog is a deep blue because it is reflecting the blue sky above it. The trees are shading it from the sun's glow otherwise it might be yellow or orange.

This snow scene is shrouded in heavy fog and this creates very diffuse lighting, there isn't any shadow whatsoever beneath the trees.

Water

Water also plays a big part in how natural light interacts with the world around us, being a common feature of the landscape in the form of rain and dew, or lakes, rivers and the sea.

Water changes surfaces that are wet because unlike most natural substances it is highly reflective and causes strong directional highlights. Dew in grass for instance can cause thousands of little highlights as it catches the morning sun, with each drop acting as a lens. Specular reflections are comparatively rare in nature unless water is present and so we can instantly recognise when surfaces are wet. Like volume in the air, water can be very atmospheric.

Another major effect of water on light is that it reflects light back up into the landscape, if you are by the sea you will have a lot more light reflecting on you because of this.

Finally water is also the cause of many atmospheric effects, from rainbows to haloes and ice rings.

Small drops of water will cause a multitude of specular highlights on a surface, even in overcast light such as this. Note that the drops are reflecting the white sky.

The strong mirror-like reflections on the pavement here tell us that it is wet.

The sticky liquid on these berries give the surface strong highlights that accentuate the texture of the skin. We know this surface is wet because this kind of reflection is not normally found in nature.

Final thoughts

Natural light is a complex and constantly changing phenomenon, it does follow some patterns and obey the rules of physics but it is too complicated to completely explain in an article of this length. What I hope to give is some guidelines that can help to understand it in different conditions, and hopefully arouse your curiosity enough to observe it for yourself. By making your own observations and applying them to your own work you can steer clear not only of

obvious mistakes but also of cliché. Finally, reality is only a starting point and there is always room for interpretation and exaggeration.

One thing I am wary of is common wisdom or rules that are passed down unthinkingly, an example of this would be that warm light should have cool fills. This can be true in natural light, with yellow sunlight and blue shadows for instance, but there is a physical cause for this and it is not a rule to be followed blindly. In other circumstances it might not be true, broken cloud would be one such situation.

The same applies to the theory that shadows should be in a complimentary colour to the main light. This can indeed be a common perception as our brain can fill in the shadow with the complimentary even if it's not really there (something a photograph should be able to establish easily). The point is to only apply this if you have observed it yourself, or you want that particular effect - not because it's a rule.

The best artist to study if you want to get a better understanding of natural light in all its many facets is Claude Monet, most of his work deals exclusively with light. Although his painting style is quite rough and loose his depiction of light is incredibly accurate. He made several series of paintings that deal specifically with changing light, such as his Haystacks series or the Rouen Cathedral paintings.

Go to part 4: Artificial and indoor light

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LIGHT

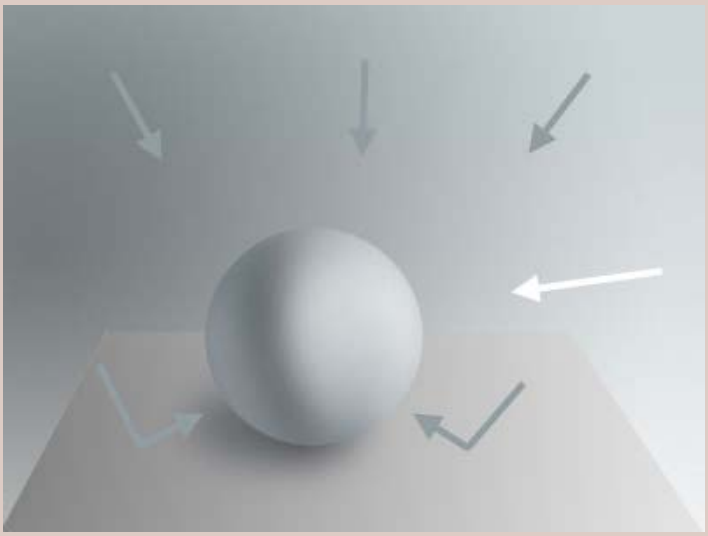
Part 4: Artificial and indoor lighting

Light indoors has a very different character to that found outside, mostly down to the lack of direct sunlight found indoors. With human beings in control of the light source there is an added twist in that the light is often designed for a specific purpose. For instance household lights are designed to give off appealing, generally diffused light whereas office lighting is more functional and cost-effectiveness is often the overriding concern - which is why office workers have to walk around in a green murk.

Most artificial lights indoors are diffused, that's the purpose of the lampshade, in order to soften the light and the shadows it produces. The major exception to this is spotlights, which produce hard lighting. However lighting designers will generally use multiple spotlights so that there isn't just one hard light but several which together will soften one another's shadows, yet still create a multitude of highlights.

Sunlight indoors is almost always diffused as it bounces between walls, floors and ceilings. Direct sunlight can get in through windows and skylights but because of the comparatively small size of windows in relation to walls much of our homes never comes under the light of the sun before it has been reflected by one surface or another.

Window light



Window light is how we generally see natural light indoors. Since the window itself is the effective light source this means that the light is quite soft (since a window is a large source). Window light is attractive and very photogenic. If there is only one window then contrast is relatively high despite the soft light source, with multiple windows contrast can be lower since there will be more fill light.

The colour of the light is dependent on many things: firstly the weather will affect the light coming through the window, if it is overcast the initial light will be white, grey or blue. In sunny conditions it will be either blue skylight or white, yellow or red sunlight (depending on time of day). Once the light comes through the window it will also be affected by the surfaces that it reflects from in the room. Wall, floor and furniture colours will all influence the light as it bounces around.

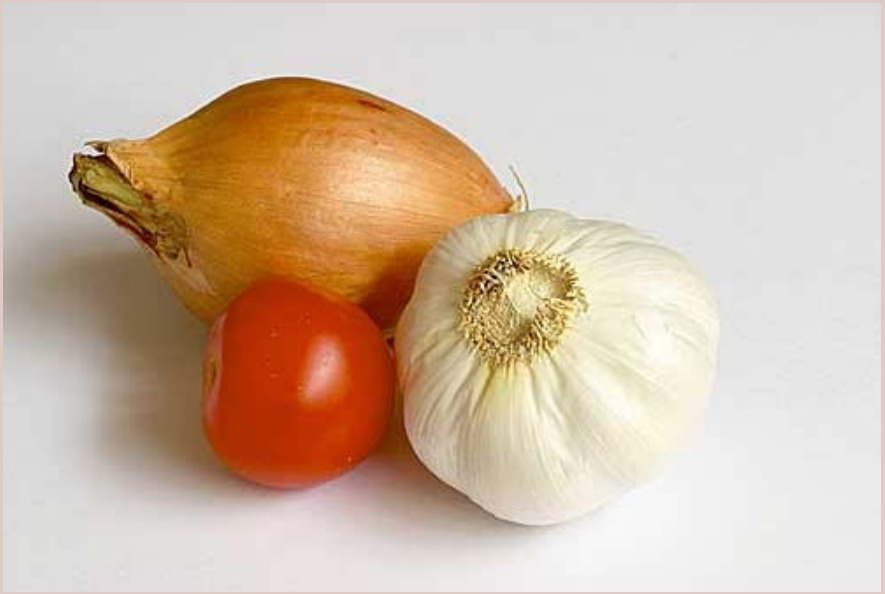
Obviously all these factors mean that to convincingly portray window light you will need to think very carefully about all the possible permutations and plan the strength, colour and contrast thoughtfully. The simplest set-up would be an overcast day with white light coming

into a white room from one large window, you can then plan any permutations using this simple model as your starting point and vary it from there.

One very famous type of window light is called the North Light, essentially the light provided by a north-facing window. In the past artists didn't have reliable artificial lighting, and so by having a studio with a window that faced north it was possible to have a fairly constant and consistent light throughout the day. The reason of course being that the sun is always in the south (in the northern hemisphere at least), so only diffuse light from the sky would shine in through that window - soft light with no strong direction or shadows. The main qualities of the North Light are the same as any window light without direct sunlight. Although north-facing rooms are dark due to lack of sunlight the light is quite pleasing.

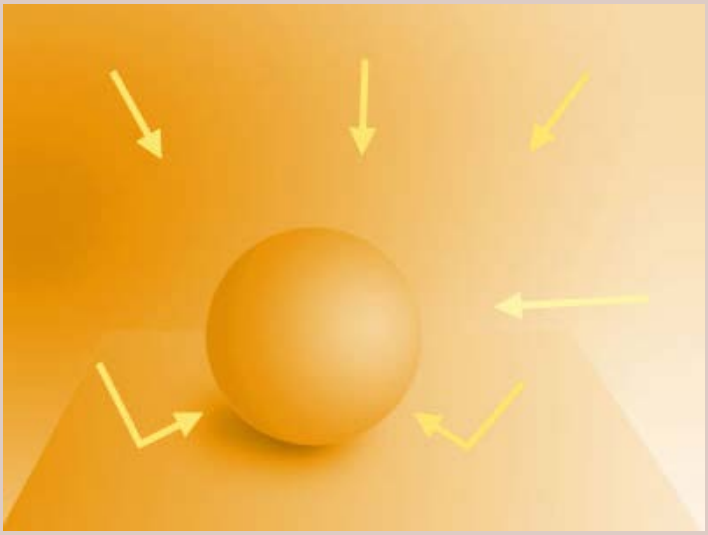
Although there is direct sunlight coming into this room it affects only a relatively small area. Most of the light on the walls and furniture is coming from a reflection of this sunlight or the diffuse light provided by the window itself. Notice the red colour on the far wall, which is probably a reflection from the curtains. Also note the high contrast that the sunlight creates, the highlight areas are very bright.

Here is an illustration of how soft the light from a window can be. The photo was taken in overcast weather and the window is acting like a giant softbox for this portrait. The closer the subject is to the window, the softer the light. If you're not sure what is meant by soft light this will be explained in Part 5, but for now notice how the edges of the shadows are blurred and the transitions between light and dark are softened.



The soft light that a large window provides has been used by artists for centuries (and is still often used by modern day photographers) because it is beautiful, predictable and readily available.

Household tungsten lighting



This is the most common form of indoor lighting we encounter on a day-to-day basis, it comes in many different forms from overhead bulbs to lamps and side lights and its common feature is that it uses incandescent bulbs.

The colour of tungsten lighting is a strong yellow/orange as demonstrated in part 1. This is because the light bulbs we use can be easily manufactured to emit this colour, and since our brains have the capacity to filter out the orange colour we perceive it as being white. Generally if you are photographing, drawing or painting a tungsten lit interior it is more realistic to depict the light as being whiter rather than more orange since our own perceptions should be used as the benchmark to follow, rather than absolute reality. Photos or drawings that look bright orange might in fact look less convincing despite being more accurate.

The quality of tungsten lighting however is far more varied and less predictable though, since there are many different approaches to lighting interiors. In ordinary households most lights will be diffused by the use of a lampshade, making the effective size of the source bigger and softening the light.

Lighting in your average house will vary from room to room, with the function of the space dictating the quality of the light. On the most basic level a room such as a utility room or a garage might have a single bare bulb, giving hard unattractive light. This would be acceptable in such a room because little time is spent there and so functionality will take precedence over aesthetics.

In a room where one might spend a lot of time, and where quality of light might be considered important in order to create a pleasant and comfortable atmosphere, you are likely to find a more complex and attractive lighting scheme. For instance in a sitting room (which might be the centrepiece of a home) you could find a large number of lights which are used together to create a pleasing ambience.

Function will also play an important part in other areas of a typical home, for instance in a bedroom you would expect to find bedside lights because they are convenient for bedtime reading or for getting up in the dark. In a kitchen you might find spotlights designed to light up the cooking area or work surfaces, and bathroom cabinets and mirrors might also have dedicated lighting for functional purposes.

Apart from in the most basic situations, most household lights will have a combination of function and light quality. The most common accessory to a household light is the lampshade, which however comes in many forms - all of which are designed to soften the light to some extent. A lampshade will hide the blinding glare of the bare bulb and soften the hard shadows created by the naked light source.

The next important element to consider is that the vast majority of interiors will use a number of light sources, which will further soften the light and shadows. The light from different rooms will spill over in to adjacent spaces and most rooms will have more than one light in them. Typical examples might be sitting rooms with four or five different lights used to create small

pools of attractive light, or a modern kitchen which might have rows of recessed spotlights in the ceiling.

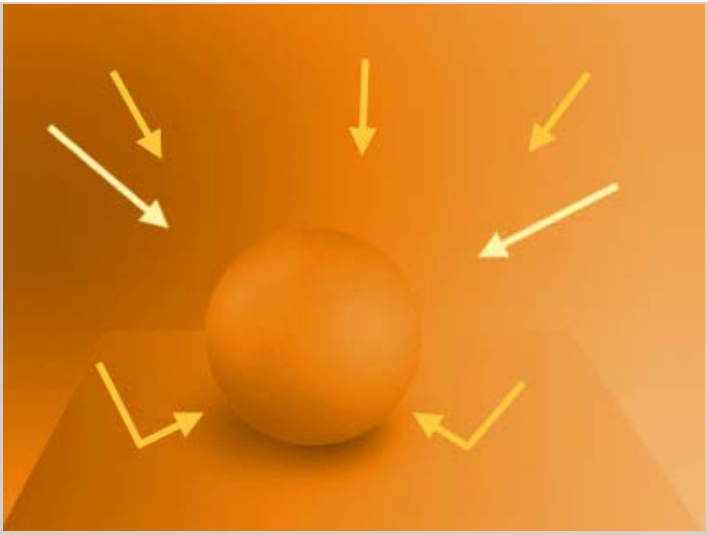
Multiple lights used in this manner will create uneven and interesting lighting across the room and will cast multiple shadows, often with different levels of hardness or softness. The other very obvious result of having a number of light sources is that reflective surfaces will have multiple highlights, one for every light. It is also possible that the lights will have subtly different colours and intensities from one another because bulbs get dimmer and redder as they get older.

Finally you should consider that certain other household devices can emit light, computers and televisions being the most obvious examples but there are also microwaves, cookers and a multitude of other items which might emit some light in a typical house.

As ever the only advice I can give is to study a number of interiors for yourself, since this subject is limited only by human imagination and there are infinite variations this theme.

This is a fairly typical interior with several lights used to create atmosphere, notice the various methods used to soften the light with lampshades and by bouncing the light off the wall. As a result of using a number of diffused lights in this manner there are no hard shadows. In this image I've tweaked the white balance to make it a lot less orange as the real colour of tungsten lighting doesn't look realistic, but using a mellower suggestion of orange looks quite convincing and conveys the colour we actually perceive ourselves.

Restaurants, shops and other commercially designed interiors



As with ordinary household lights this kind of lighting is very varied and primarily used to create mood and direct the eye. In a lot of cases this lighting is designed with great care to create the desired effect so it should take some careful study to recreate what the designers have aimed for.

Restaurants generally have low, soft lights in numbers to create atmosphere. There might also be quite a mixture of different kinds of lights from spotlights to pick out the flowers on the table to candles on the tables themselves. Obviously no two restaurants will be the same so expect a great deal of variety from one place to the next. Observing restaurant lighting carefully is a great way to understand how mood and atmosphere can be created with interior lighting.

One important detail to note when recreating the atmospheric lighting you might find in a restaurant or bar is that the relatively large number of lights used will also create many reflected highlights - these will be visible in all reflective surfaces from cutlery and plates to people's eyes. As with household lighting the different sources will vary in colour and intensity, creating pools of light across a room.

Shops have different lighting needs, and although atmosphere is still important cost and good visibility are probably the main criteria. Most mainstream shops will be brightly lit with strip lights to create a bright and clear environment with maybe extra lighting to pick out specific displays. As ever if you are trying to recreate a specific environment it pays to think of the specific function the place fulfils before trying to recreate the lighting.

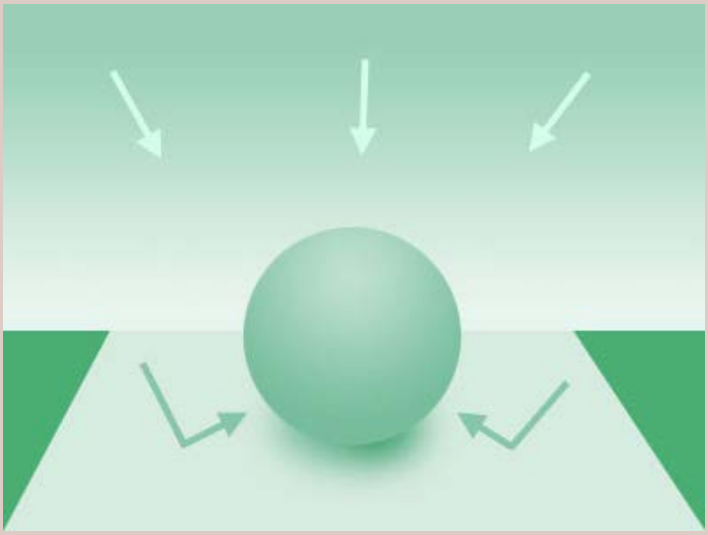
Obviously as before it goes without saying that this topic is vast and varied, and there is far more variety than I can ever hope to cover in an article of this scope. The best thing to do as ever is to make your own observations, and maybe take some photographs in various settings for reference.

This is a fairly typical (if colourful) restaurant with a multitude of lights used to create atmosphere. There is colour and visual interest everywhere and a lot of thought has gone into this fun space.

Here is a closer view, notice the high number of highlights in the glasses, they are reflections of all the different lights.

A typical shopping centre with bright lighting, I've colour corrected the image but the slight green tint from the lighting is still visible. Notice the multiple shadows under the chairs which come from multiple light fixtures.

Fluorescent lighting

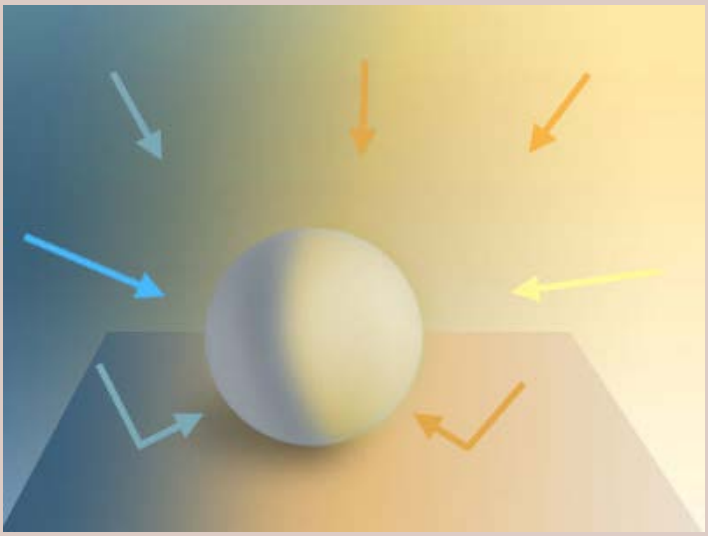


Fluorescent lights are primarily used in situations where cost is a factor, their colour temperature is usually greenish, and despite the fact that our brain can compensate for the white balance we still perceive the light as being quite ugly. This kind of lighting is commonly found in offices, stations, public buildings and anywhere that needs to be lit on the cheap.

Fluorescent lights are often used to light relatively large areas with many individual lights, meaning there will be complex overlapping shadows and multiple rectangular highlights. The density of lights will dictate the brightness of the lighting: settings such as shops using many lights to create a bright environment and more spartan spaces such as car parks using fewer and thus being darker.

This photo was taken with daylight balanced film under fluorescent strip lights, you can see the strong green cast that these lights have.

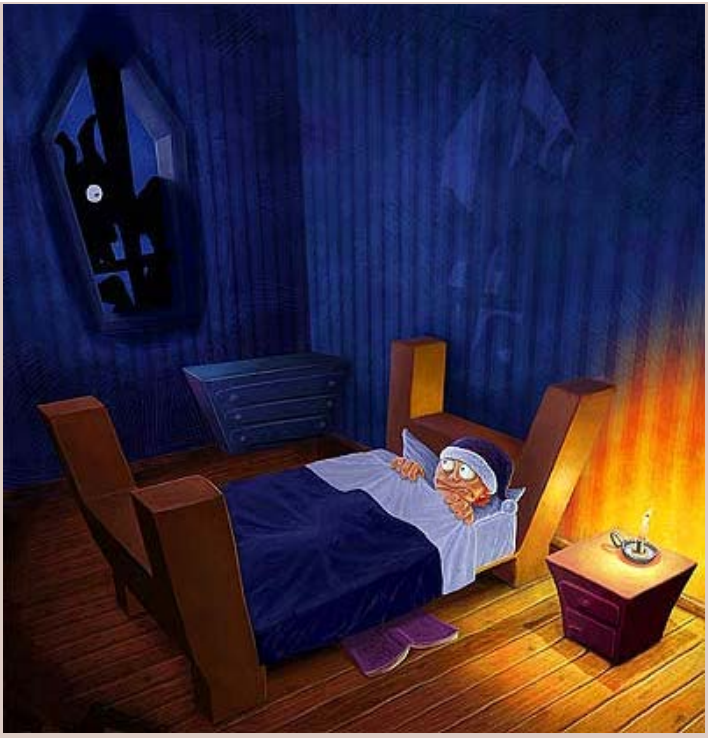
Mixed lighting



Both indoors and outdoors it is very common to see a mixture of natural light and artificial light, especially at dusk and at night. This can lead to very interesting mixtures of colours and intensities, especially since natural light and tungsten light often have complimentary colours in blue and orange.

Any object near a window whose curtains aren't drawn in the evening or at night would have some mixture of natural and artificial light on it. This kind of lighting is obviously very commonly found outdoors too, for example things illuminated by street lights usually have some natural light as fill. Lights on buildings too can have very interesting colours and create striking contrasts with natural light coming from the sky.

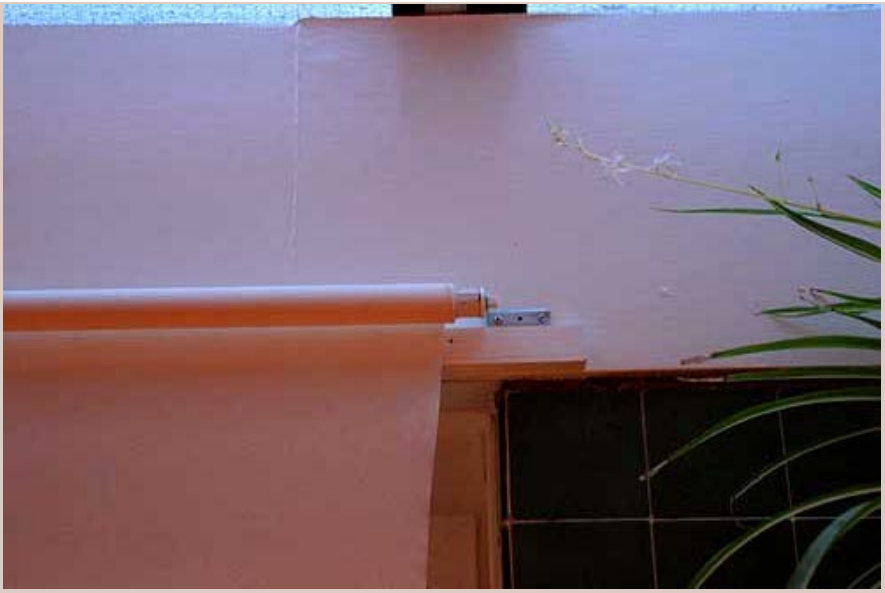
I personally find mixed lighting very atmospheric and inspirational, and I use it frequently in my work because of its interesting visual appeal.



These two samples from my own work show how mixed lighting can be used to create atmosphere and interesting colour schemes.

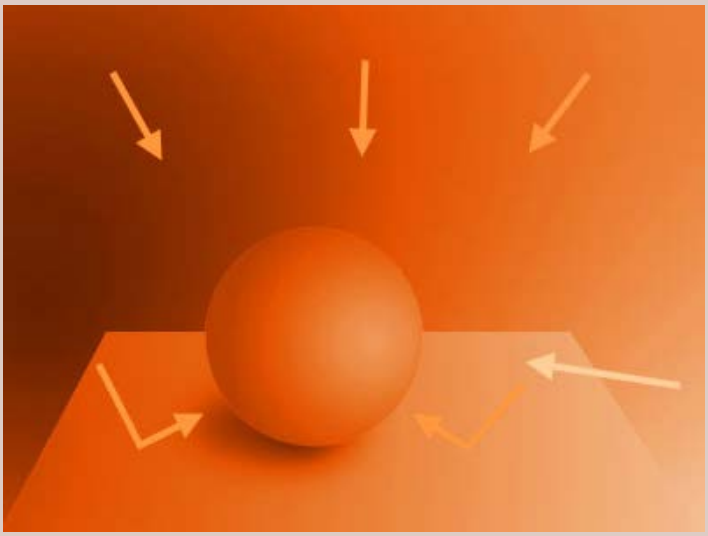
Here we can see how interesting colours are created by design in urban settings, with the warm lights on the Houses of Parliament probably designed to compliment the natural evening light.

Here the mixture of colours looks positively alien, with the green of fluorescent lights in the windows mixing with both tungsten light and skylight.



A more mundane example which shows what happens near windows when light is coming from both inside and outside.

Firelight and candlelight

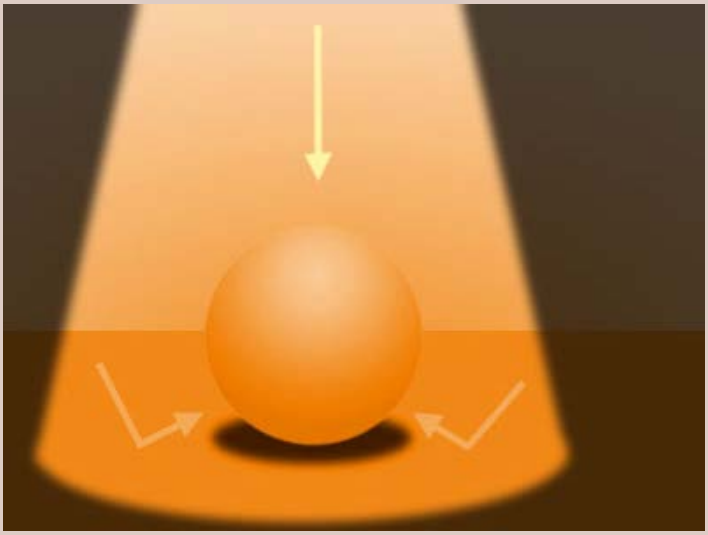


Light that comes from a flame is even redder than incandescent light from light bulbs, in fact its colour temperature is so low that our brain can't compensate for it and we actually perceive it as orange or red.

The other important fact to consider with these kinds of light sources is that they are often placed much lower than incandescent lights: fires are usually at ground level and candles are placed on tables or other furniture, whereas bulbs most often light from above. This will have an obvious effect on everything from the way that light strikes various surfaces to shadow and highlight placement. Finally it is worth remembering that the light source is often moving as light from fire and candles flickers.

Candle light is very red, here I've toned down the actual colour temperature to make it look more natural. Our brain can't really compensate for colours that are so strong so we do perceive the light as being warm.

Street lighting

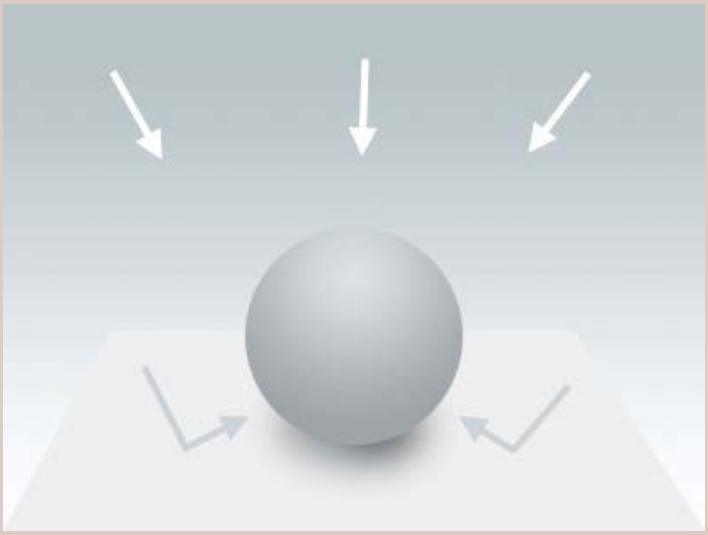


Street lights are a deep orange (in the UK at least where I live), and they have a very narrow spectrum meaning that they can't show any other colours. This makes everything under them appear a very monochromatic orange.

In between two or more street lights objects will cast multiple shadows. Another thing to observe is that the pool of light underneath them is usually quite small, and fades into darkness quite quickly, making streets at night very high in contrast.

You can see how narrow the range of colours is under typical street lighting, everything except the grass is orange. The shadows point in various directions because of the multiple lights, and contrast is very high without any fill light. The sky behind the branches is also orange due to light pollution from the London street lighting.

Photographic light



A full explanation of photographic lighting is far beyond the scope of this article, but I do want to mention it briefly, mostly so that photographic reference can be used wisely. Of course there are many types of lighting used in photography, but the most commonly found in portrait and product photographs is very soft light from a diffused flash.

This kind of light is easily recognised by the absence of shadows, so if your photographic

reference features this sort of lighting you should take this into account and adapt it according to your own requirements. Of course this applies to any lighting found in reference material.

This soft shadowless light with broad highlights is typical of contemporary product and portrait photography, particularly in advertising. It is created with the use of very large softboxes, which act as large diffuse light sources.

Other kinds of light and special cases

Hopefully I have been able to outline most of the commonly occurring types of lighting. However my intention isn't really to create a guide for every possible situation but rather to encourage observation and understanding. It is so easy to take lighting for granted and not notice its behaviour even though we see it all around us all the time. In fact looking and noticing in the first place seems to be the hardest thing, it is actually quite easy to reach an understanding once this crucial first step has been taken.

So hopefully, with the knowledge gained from this article, it should be possible to work out how light behaves in other situations which aren't specifically explained here. For instance you may need to figure out how to light an underwater scene on a tropical reef. Where would the light come from? How would the light react in this environment? What colour would it be? How much reflection would there be? What about diffusion, clarity, shadows etc...

I really hope that readers will be able to use the information here as the launch pad for their own observations. Too often it is so easy to parrot clichés that are recounted without thought (3 point lighting being a prime example), and when so little quality information is available about light in the first place it leads to the same old tired formulas being repeated over and over. However with your eyes open it is possible to formulate your own thoughts and make your own original observations. This really is the purpose of my article.

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