David Praekel. 2007. *Lighting*. Λωζάννη: AVA

Αποσπασματική παράθεση: (2)

Seasonal quality

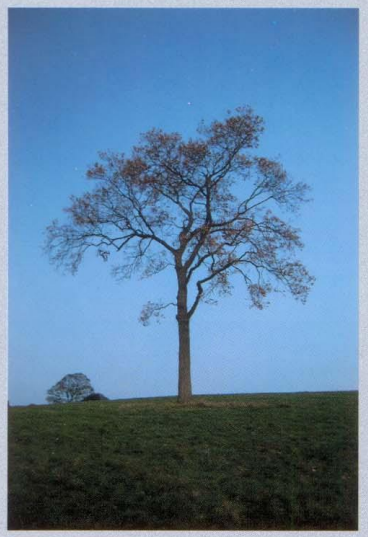
Since photography was 'discovered', its practitioners have charted the changing seasons. Putting aside the abundance of seasonal subject matter, the light itself changes dramatically from season to season. This is partly because in a familiar landscape different features are illuminated by the sun on its seasonal progression, but also because the quality of the light and its elevation changes with the seasons just as it does during the progress of the day. Winter light will have a lower colour temperature and fall across the landscape; summer light will have a much higher colour temperature and, in June and July at the latitude of London, it will reach about 60° elevation above the southern horizon. Only at the Equator is the sun directly overhead in the summer months.

Seasons of the tree (below and facing opposite)

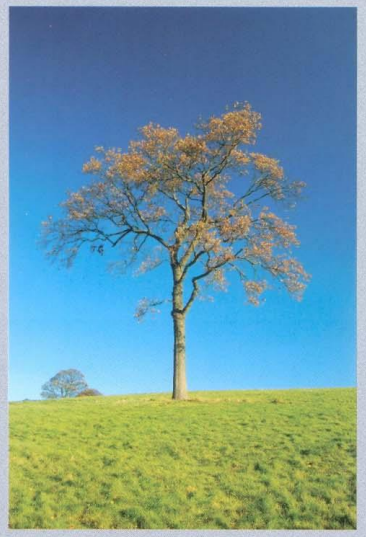
This year-long cycle of photographs of a tree was undertaken as part of Spence's graduation exhibition where she charted a number of trees in different locations at times throughout the year. Meticulous planning is the key for such a project. Once a tree and view were identified, the camera position was established using a compass and string so the exact camera location could be re-established using the tree as a reference point.

Photographer: Becca Spence.

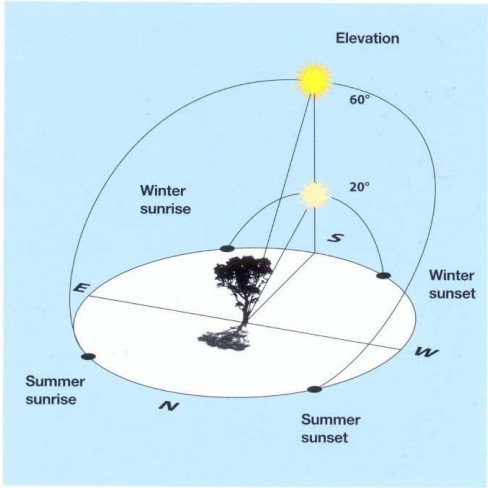
Technical summary: Nikon D50, 18–55mm DX AF-S Nikkor, ISO 200. Summer: 1/5 sec at f3.5, Autumn: 1/125 sec at f/5.6, Winter: 1/80 sec at f/4.5, Spring: 1/125 sec at f/5.6. No filters and no Photoshop.



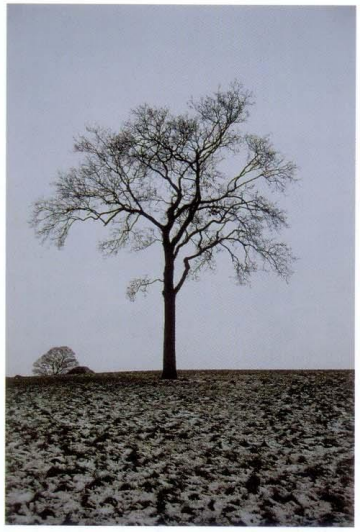
Summer



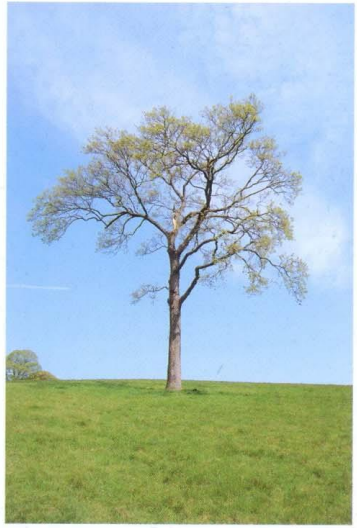
Autumn



The sun rises in the east and sets in the west but the seasonal variation is marked – sunrise and sunset at the winter and summer solstices are much further north or south than you might imagine (diagram true for 50°N London).



Winter



Spring

Incandescent lamps

The word 'incandescent' simply means glowing. As we saw in the first chapter, the source of our light is energy radiating from heated objects. In the case of the common household light bulb, this is a tungsten metal filament in an inert low-pressure gas atmosphere inside a glass envelope. In some 'living' museums, you may find carbon filament lamps in use; these were the forerunners of the modern metal filament bulb. Made from a carbonized bamboo, they give off a most attractive rich light and can be interesting photographic subjects in their own right.

As with candlelight, over-correcting the light from tungsten bulbs – to show a pure white in the colour print or digital file – is not correct. Though our brains compensate for the very yellow quality of their light, we associate household light with some yellow warmth and expect to see that in images of domestic interiors. Some photographers completely ignore the idea of colour balancing to the colour quality of incandescent light and do not attempt to correct its very yellow look on daylight film. Nan Goldin is one such photographer; in fact, one commentator used the phrase 'incandescently tawdry' in describing her work, possibly unconsciously connecting this aesthetic comment with the actual technical realisation and limitations.

Simple reading lamps and cheap spotlights using tungsten bulbs can be used very successfully for tabletop photography with a range of card and aluminium foil as miniature bounces. Some published professional quality flower images have been created using such simple equipment; it is more often attention to detail and aesthetic judgement that creates a beautiful image, not the use of expensive equipment.

Photofloods exist as a halfway point between domestic lighting and studio tungsten, though there are a handful of companies (Interfit and Stellar) producing professional studio fittings for these bulbs. Overrun photoflood bulbs produce a bright, whiter light than studio tungsten lamps and can be used in domestic light fittings (but see note below). They produce light at 3400K rather than the more yellow 3200K of studio tungstens. Both 275-watt and 500-watt (P1 and P2) bulbs will draw too much current to be safely switched through domestic light fittings. Some photographers get an electrician to produce a simple circuit board where two lamps can be run dimly in series for setting up and then run in parallel for full output. This also extends the life of the bulb which will be only 8–10 hours at best.

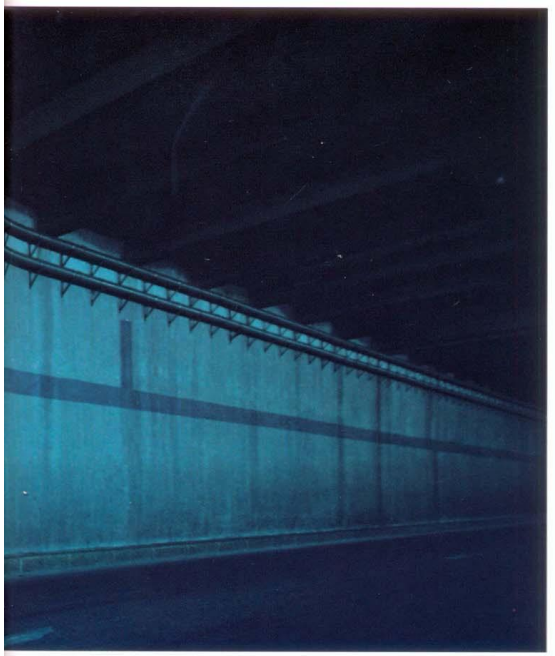
Note: Modern energy-saving light bulbs that fit into domestic light fittings do not have the same colour temperature as the tungsten/incandescent bulbs they replace as they operate on the same principle as the fluorescent light. If in doubt, check what is in the fitting or take a custom white balance reading.

photoflood tungsten filament (incandescent) lamp running at higher voltage than normal (overrun), which means a short life, colour temperature either 3200K or 3400K

Fluorescent light

Fluorescent light can pose a big problem for the photographer. It does not produce a continuous spectrum of colours but is a mixture of spikes of quite distinct colours, usually an unpleasant combination of green and orange/magenta light (with distinct spikes at 430, 550 and 610nm in cheap tubes). Not only that, but it flickers.

A fluorescent strip light is a partially evacuated glass tube with a small amount of mercury present. An electric current is passed through the tube, which causes the mercury vapour to emit strongly ultraviolet light – just like mercury street lighting. However, the inside of the strip light tube is coated with phosphors – materials that fluoresce – which absorb the UV light and give out visible light. The precise colour mix of light from a fluorescent strip light depends on the exact recipe for the phosphors. Different mixtures of the chemicals give different colour qualities of light that vary from manufacturer to manufacturer, change throughout the age of the light and depend on the cost and application of the strip light in question.



Nightmare (left)
The eerie green of uncorrected fluorescent light adds an element of alienation and edginess to this scene.

Photographer: Karl Fakhreddine.

Technical summary: Canon 1DS Mark II, Canon EF 16–35mm f/2.8L at 16mm, 1/30 sec at f2.8, ISO 1600, Custom white balance. Two assistants stopped traffic for the shoot in a tunnel below a shopping centre.

Digital photographers wanting to white balance to a fluorescent light source will usually have two or more preset values for fluorescent light. These will cover common fluorescent tubes as used in warehousing, to the so-called 'cool white', 'warm whites' and 'natural sunshine' (high colour rendition) lights used in offices and retail settings. The film photographer is less well-off, having to use an FL-D (fluorescent to daylight) filter that will often make only an approximate correction. The light quality may still have that distinctive look of strip lighting in the final print.

Lightboxes for viewing transparencies and negatives are a useful source of light for tabletop photography. These are invariably fluorescent light sources but the best will be daylight balanced. For small objects, they offer a large diffuse, continuous light source that is easy to position. For overhead lighting, it is sometimes easier to prop a lightbox on a couple of bricks than manoeuvre a big softbox with its counterbalanced boom and studio stand.

High quality fluorescent panel lamps are available for studio use. They use electronic ballasts that suppress the flicker seen with cheap fittings. Available with tungsten or daylight colour balance, they produce a colour consistent output over a long lamp life of around 10,000 hours.

Neon light

Neon light is another form of discharge lamp, but it uses special gases in a clear tube to create strongly coloured light rather than attempting to produce a balanced white output. Not surprisingly, one of the first gases used was neon, which gave the gas discharge a characteristic red glow. Nowadays, a range of well over 100 distinct colours can be produced with a mixture of gases that includes argon, neon and carbon dioxide, combined in proportion with mercury vapour and fluorescent phosphors. Neon sign-makers show a catalogue of 'whites' ranging from blue-white 8300K to yellow-white 2400K, along with blues, greens, 'golds', reds and violets.

As it is the colours that the photographer is looking to capture, there is no colour correction or balancing applied. The best results are obtained using daylight saturated warm film or by increasing the digital saturation slightly in-camera with either a custom, automatic or daylight white balance. The best time to photograph neon has to be after recent rain. In this way, you can 'double your money' as the bright neon light sources are reflected on wet surfaces.

The necessary long exposures suggest creative opportunities, such as blurring the image for part of the exposure only or producing intentional camera shake. Focusing and de-focusing during exposure gives attractive halos of blur depending on the relative time the image was in or out of focus during the exposure. Alternatively, a zoom lens can be zoomed during the exposure, but the camera should be kept steady to simplify the effect. If the neon signs take up only part of a very dark frame, a double exposure can be used to duplicate the bright sign into the dark, effectively unexposed, part of the frame on the second exposure. (There are only a couple of professional digital cameras that allow true double exposure in-camera.)

Water colours (left)
A long exposure and reflections in the wet pavement make the most of colourful sources of light from this fun fair in Alkmaar, in the Netherlands.

Photographer: Wilson Tsoi.

Technical summary: Canon PowerShot A80 (4MPx), 7.8–23.4mm f/2.8–4.9 (built-in lens), 4 sec at f/8, ISO 50 on tabletop tripod triggered with self-timer in rain at night.

Photography in low light

Subject	Exposure Value (ISO 100)
Moonlit landscapes (moon not in picture)	EV3–4
Candlelight	EV4
Christmas tree lights indoors	EV4
Floodlit buildings at night	EV4
Traffic (light patterns from moving vehicles)	EV4*
Fairgrounds	EV4–EV6
Room interiors	EV5
Subject lit by blazing bonfire	EV5
Museum/art gallery interior (well-lit)	EV5
Room interiors (white walls, bright lights)	EV6
Christmas tree lights outdoors in snow	EV7
Brightly lit city streets	EV7
Theatre/circus (floodlit–spotlit)	EV7–EV9
Shop windows	EV8
Bonfire	EV8
Floodlit sports field	EV8
Skyline at sunset	EV10
Moon (close-up with telephoto)	EV13
Fireworks	use B at f/16**
Lightning	use B at f/8**

* but use small aperture
**leave shutter open but cover lens between flashes/bursts

Continuous light

Continuous light is lighting that is on all the time. What you see in front of you in the studio is what you photograph. For this reason alone, it is often favoured by those starting out. Nor do you need a special flash meter, as any ambient light meter will work. Continuous light sources fall into three categories: **Tungsten** lights, metal discharge lamps and fluorescent panels. Tungsten lamps are rated by the wattage of their bulbs and are available in a range of powers from 500–2000 **watt**. Remember that some of this energy is converted into heat as well as light, so tungsten studios can be hot and smelly places in which to work! This is the lighting that tungsten balanced film was created for. If daylight balanced film is used it must be exposed through an 80B filter, or alternatively blue gels can be used over the lights. Digital cameras offer preset tungsten white balance, though a custom measurement is preferable as the colour output changes as tungsten bulbs age. Black-and-white film will be slightly underexposed by the yellow tungsten studio lights, so compensation should be made for this.

With their long history of manufacture, some brand names are synonymous with the lamp type – you would commonly hear a tungsten spot lamp referred to as an 'ARRI'. As perhaps the oldest form of photographic lighting, tungsten offers the full range of **spots** and floods, with light shapers such as 'barn doors' and beauty dish reflectors now also used on **flash heads**. Though tungsten lamps look bright, it is sometimes hard to get sufficient depth-of-field with slower films/low ISO sensitivity. Heat build-up also makes it difficult both to adjust the lights and to use gels. Though cheap to buy, the running costs of tungsten can be high.

Studio fluorescent lights balanced for daylight use are a more recent introduction, though they have been used successfully in colour television studios for years. Tubes are arranged in banks to create a soft, diffuse light quality similar to that from a **softbox**. The least expensive units – though supposedly daylight balanced – give an odd light quality (see pages 78–9 on fluorescent lights). Professional fluorescent lamps are bright, but many fluorescent flat panels that are sold as suitable for still photography are prohibitively limited in output, which restricts their use to still life and wide apertures.

Metal discharge or high intensity discharge (**HID**) lights (including **HMI** and **HQI**) are named after the mercury used in the bulbs. They are used widely for lighting film sets in the motion picture industry. They run at daylight colour temperature, are flicker free (better than fluorescents for digital work), cooler than tungsten lamps and produce a good quantity of light. Their popularity is growing with still life and room interior photographers because of their easily mixed colour balance and controllable output.

Fluorescent panels – Photon Beard Highlight.

Tungsten lamp.

continuous light any light source that shines without break or interruption – usually used for tungsten lights to distinguish them from flash
flash head usually a combined flash tube, modelling light and cooling fan that takes its power from a separate battery pack or generator in contrast to an integrated monobloc/monolight
HID lighting generic term for High Intensity Discharge lighting, including HMI and HQI lamps
HMI lamp (metal halide) type of HID lamp; rapidly pulsed light giving effectively continuous output running at daylight colour temperature (5600K), (from hydrargyrum (mercury) medium-arc iodide)
HQI lamp (metal iodide) type of HID lamp (from hydrargyrum (mercury) quartz iodide)
softbox box or frame covered with translucent (light diffusing) material, used over flash head to create a soft light, available in various sizes
spot (mini spot and zoom spot) spotlight; small spotlight; spotlight with adjustable reflector
tungsten incandescent (glowing) electric light bulb with filament of tungsten metal; hot and inefficient, but unlike flash its effect can be seen and judged. Used as modelling lamps in flash heads
watt SI (Système International d'Unités – International System of Units) unit of power – the rate at which work is done – one joule of work per second of time. Watt rating of tungsten lamp indicates light output

Flash

A modern flashgun is a most versatile light source; powerful yet lightweight. Their light can be bounced or diffused just like any other light and electronic flash is balanced at daylight colour temperature. There are disadvantages – the exposure is only correct for a set distance, which can produce dark backgrounds and overexposed foregrounds. There are pronounced bright reflections in shiny surfaces with flash and this cannot be easily previewed, although some modern flashguns have a low power modelling 'rapid fire' setting that shows (just about) where reflections will be.

Accessory flashguns are more powerful and can be used both automatically and manually. Communication is through the camera '**hot shoe**', which has electrical contacts to fire the flash. In many cases, the camera electronics will interact with the flashgun to fire a metering pre-flash and also use flash for autofocus illumination in the dark. To reduce red-eye and give some modelling light, an extension lead is used between the flashgun and camera to move the flash away from the lens. Many photographers use bounce flash or diffusers to improve the light quality, but these techniques can sap power. So-called 'professional' flashguns are high powered with rapid recycling and many use a separate **battery pack**. **Slave flashes** are independent units that fire when illuminated by the flash from the main unit. They are handy portable sources of light to illuminate small, shadowed areas or to give background effects.

Automatic flashguns are still commonly used with medium format cameras without light meters. These guns use a flash calculator (a scale or dial) where aperture and film speed can be related to the flash unit's guide number. A sensor in the flashgun quenches the output from the flashgun when the subject has received enough light. However, just as with reflected light meters, automatic flashguns give problems of under- and overexposure with very light or very dark subjects. You can compensate manually; if the flashgun says f/11, using f/16 on the lens will effectively halve the apparent power, using f/8 will double it. Dedicated flashguns do not allow for this as they set the aperture from the camera's electronics. With a film camera you can cheat by overriding the DX film speed: setting ISO 50 instead of ISO 100, for example, will force the flash unit to give one more stop power, setting ISO 200 will give one stop less.

Typical guide number 6–12 m/ISO 100.

A built-in flash on a compact digital camera is close to the lens axis and red-eye will result without a red-eye reducing pre-flash. Low power useful for daylight fill.

Typical guide number 10–15 m/ISO 100.

A pop-up flash moves flash to some degree off lens axis, but red-eye may still result. Output can be adjusted to better balance flash to ambient light .

Typical guide number 15–50 m/ISO 100.

Auxiliary flash 'talks' to camera through a hot shoe. Flash is away from lens axis and can be rotated, diffused or bounced. Used off-camera with lead or wireless flash.

Flash – guide numbers

There are three key specifications for any flashgun – **guide number** (a measure of flash power for a given film speed), recycling time (the speed to recharge between flashes) and coverage (the angle that the flash beam covers).

Exposure calculation with a manual flashgun – or flashbulb for that matter – is done using the manufacturer supplied 'guide number'. This single number relates lens aperture and distance to the subject for a particular film speed or ISO sensitivity and is an indication of the effect a flashgun will have under standard conditions. Guide numbers are given for a particular film/ISO sensitivity, usually ISO 100, and for flash-to-subject distance in either feet or metres. Don't confuse the two! A guide number of 10 in metres equals a guide number of 33 in feet (to convert GN metres to feet, multiply by 3.3; to convert feet to metres, multiply by 0.3).

Guide number = aperture x distance

To work out the aperture: measure the distance to the subject (use your lens scale). Divide the guide number by this distance to get the f-stop. Guide number of 45 (GN) Flash to subject distance is 8m (FD) Aperture is unknown (f) f = GN/FD 45/8 = f/5.6

To work out the flash distance: divide the guide number by working aperture to get the flash to subject distance. Guide number of 45 (GN) Flash to subject distance is unknown (FD) Aperture is f/11 (f) FD = GN/f 45/11 = about 4m

To check the guide number of an unknown flash unit: set the unit to manual and the flash meter for ISO 100, place the flash 1 metre distant and take a flash reading. The aperture is the guide number.

The ideal is to use a flash meter or a light meter that can measure flash (flash output is too brief to register on an ambient light meter). A test flash is fired and the meter will give an appropriate aperture for the film/digital sensitivity in use. The best purchase after your first flash unit is a professional quality flash meter rather than a second flash unit!

battery pack power supply for flash heads that is charged by mains electricity but which works independently and can be used in the field
guide number a number used to describe the maximum coverage distance of a flash unit for a given lens aperture and film speed/sensitivity
hot shoe camera accessory shoe with electrical (hot) contacts for triggering flash when shutter is released
slave flash independently powered flashgun that is triggered by flash of main unit, often of lower power and used as effects light

Flash synchronisation

Sometimes called '**sync**' or 'synchro', **flash synchronisation** is the correct timing of the flash to illuminate the whole film frame or digital sensor. This is not so much of an issue with **leaf shutters** in medium format and large format camera lenses as they always open to expose the whole area. However, 35mm and digital SLRs and cameras with **focal plane shutters** do not. Their travelling curtain shutters must be fully open so as not to produce an unexposed bar on the image. Therefore the first curtain must have cleared the frame and the second not yet begun to travel when the flash fires. This means a slow-ish shutter speed (1/60 on older cameras, but 1/180 or 1/250 on more modern models). Slow sync speeds can limit fill-flash control with some cameras. Older cameras and lenses will have X and M settings next to the flash sync socket: X is for electronic flash; M is for flashbulbs.

Cameras can fire flashguns through a PC flash sync socket on the camera body or lens mount, through a 'hot shoe' accessory connector with electrical contact, or by means of an infrared or radio pulse from a flash sync transmitter fitted in the camera hot shoe. Plugs and cable are usually reliable if they have not been abused but they do create clutter. Infrared requires a line of sight to the flashguns to be triggered, while wireless solutions can be expensive.

The brief flash of light from an electric spark in the flash tube of a flashgun is typically of a much shorter duration than the shutter speed used on the camera. Depending on the size of the unit, the flash duration will be between 1/2000 and 1/10,000th second – short enough to freeze motion. Classic images from the early years of electronic flash photography show frozen drops of water, frogs caught mid-leap and apples, balloons or playing cards pierced by bullets (those interested should look at images by Harold Edgerton). There is still a fascination in 'seeing the un-seeable', of having flash freeze a fraction of a second for our repeated observation.

flash synchronisation timing brief burst of light from flashgun to appear between the opening and closing of the camera shutter

focal plane shutter camera shutter that operates close to the film/sensor in the plane of focus of the lens – common in digital SLRs and 35mm cameras. Comprises adjustable slit between two 'curtains' that travels to expose film/sensor to light. To synchronise properly with flash, slit must be wide enough to expose whole film/sensor, this limits maximum shutter speed at which flash synchronisation can occur

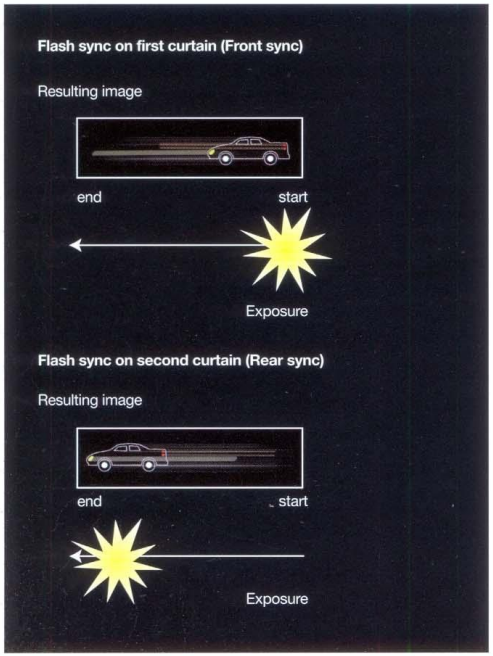
leaf shutter shutter mechanism usually found in between lens elements; because of nature of its operation, flash synchronisation can occur at any shutter speed. Usually found in lenses for medium and large format cameras

sync to time the moment a flash is fired to coincide with the correct opening of the camera shutter for a proper exposure

First and second curtain sync

It is possible to synchronise the flash burst either at the beginning of the exposure or at the end. When the flash goes off first, it is described as first or front curtain sync (after the shutter curtains). This kind of exposure gives a crisp image followed by the blurred exposure. Using this technique in the dark with a moving vehicle will produce an unnatural image with what appears to be a stationary vehicle with speed lines coming from the front. Synchronising at the end of the exposure, so-called second or rear curtain sync, will give the expected result of a vehicle trailing blurred lines.

Whether front or rear sync, it is possible to use slow flash synchronisation to great effect to emphasise movement without losing subject clarity. It is common for photographers to intentionally move the camera in a circle or jog it from side to side during a slow sync picture to ensure the ambient light component of the picture is aesthetically blurred. The flash will then superimpose a crisp image of the subject into the blurred background. The exposure guidelines for balancing ambient and flash apply as slow sync can be considered an extreme form of fill flash (see pages 106–7).

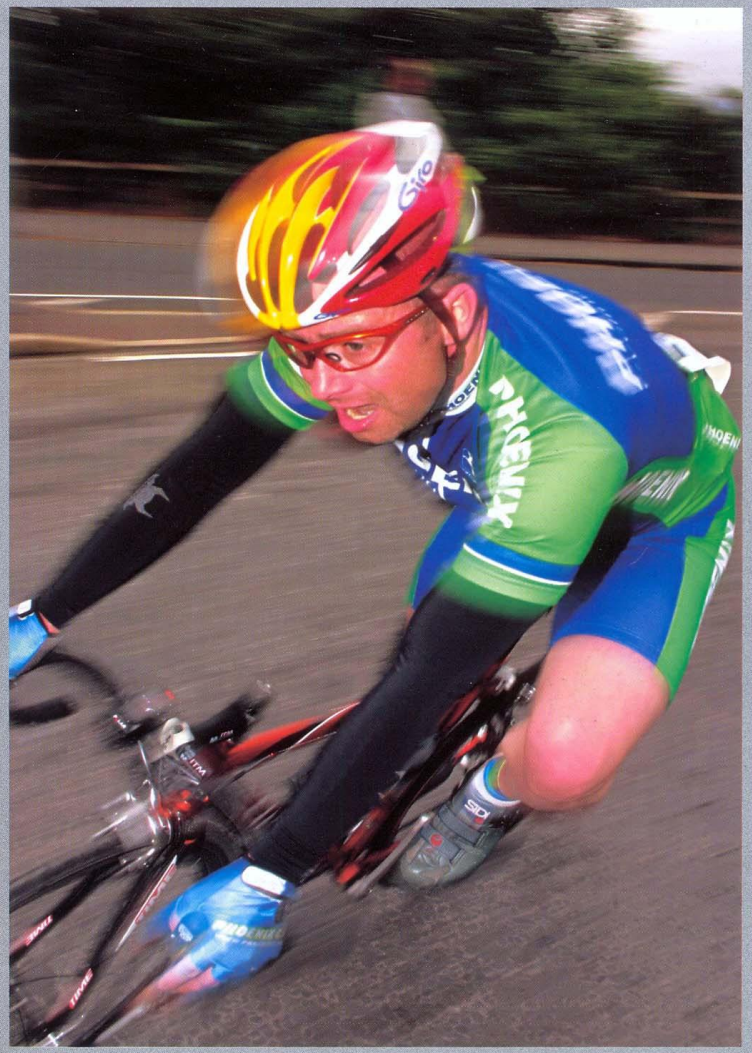


Newry wheelers (facing opposite)

Slow speed front curtain synchronisation with some camera panning creates a good combination of motion blur and a crisp well-lit image that captures the drama of competition in a three-day road race.

Photographer: Phil McCann.

Technical summary: Canon EOS 300D, Canon 18–55mm, 1/60 sec a f/8, ISO 100, Canon Speedlite 420EX.



On-camera flash

Pop-up or on-camera flashguns are convenient but always of low power. They drain the main camera batteries, usually give red-eye or unflatteringly flat lighting, and are best used for fill flash in daylight. Flash coverage is not always that great and if you are using a wide-angle zoom first, make certain you don't go wider than the angle of coverage of the flashgun unless you want a central hotspot of light. The large 'petal' lens hoods supplied with many wider zooms can cast large half-moon shadows in the bottom of pictures taken with on-camera flash. To check for both light fall-off and unwanted shadows try photographing a featureless wall square-on at various focal lengths.

On-camera flash will produce the familiar 'red-eye' effect when the flashgun is close to the lens axis (which it is with most compact cameras with built-in flash). Light from the flashgun enters the eye and illuminates the blood in the retina, which is then photographed. 'Red-eye reduction' is offered on most cameras with pop-up flash. This is usually a pre-flash (or flashes) that closes the subject's iris, but also tends to make them squint in the picture. On-camera flash also produces a very flat frontal light, giving little or no modelling effect.

Despite these negative comments, on-camera flash is tremendously useful as a fill-in light source to add some light to shadow areas and to provide **fill light** on backlit subjects. On-camera flash will lift the look of any backlit portrait but it is worth experimenting with the flash power to get the light balance you prefer – do not rely on the manufacturer's default power setting. (See pages 106–7 on Fill flash and Balancing light sources for more information.)

One time-honoured method for reducing the harsh frontal quality of on-camera flash was to drape a handkerchief over the flash tube. This not only reduced the flash output, but also gave the light a more diffuse quality. Many accessory flashguns now come with white plastic diffuser boxes that produce a more flattering light. Accessory manufacturers Sto-Fen and LumiQuest® offer a range of after-market diffusers and bounces.

Early adopters of electronic flash found it gave a better light when bounced off a nearby ceiling (or wall) with the flash head angled so the light would reflect off that surface. Because the light had further to travel and was not perfectly reflected, some compensation had to be made in the flashgun output. Modern integrated flashgun/camera metering systems do away with the need to use rule-of-thumb calculations for bounce flash. The most natural light, free of harsh shadows and unpleasant hotspots or highlights, is flash that is both bounced and diffused. Luckily, digital capture gives photographers the opportunity to experiment with flash lighting arrangements at no cost.

fill light light from a reflector of a separate lamp or flash head used to illuminate the shadows cast by key (main) light and so reduce the lighting ratio

LumiQuest Midibouncer mounted on a Sunpak accessory flashgun – front and back views.

Dribble (below)

On-camera flash – in this case an accessory flashgun – illuminates only the centre of the image when a wide-angle lens is fitted to the camera. The animal's muzzle being closest to the flash is also more brightly lit. The limitations of on-camera flash used to the photographer's advantage.

Photographer: Ian Taylor.

Technical summary: Canon EOS 10D, Canon EF 24–70L zoom, ISO 200, 1/125 sec at f/5, with Canon 550 EX Speedlight.

Studio flash

The flashguns used in studios are more powerful versions of the familiar battery-powered flash units found on nearly all modern cameras. Studio flash is usually powered by mains electricity, though there are two distinct types of unit. The **monobloc** – or monolight, as it is known in the USA – is a compact unit with an integrated flash tube, modelling light, a cooling fan, power supply and independent control circuitry. These units are more commonly encountered in small to medium-sized studios. Bigger studios tend to use **generators** – or 'pack and heads' as they are known in the USA. Generators house the power supplies and control circuits for independent 'dumb' flash heads. They are described as being **symmetrical** or **asymmetrical generators** – a symmetrical unit delivers equal power to each flash head that is plugged in; an asymmetrical unit can deliver different power to each of two, three or four outputs. The flash heads connected to generators usually have integrated compact cooling fans to moderate the heat generated by the tungsten modelling lights.

Profoto pack and heads
Typical guide number 50–300 m/ISO 100.

asymmetrical generator power supply that can feed two or more flash heads of different power outputs
generator power unit for two or more flash heads (known as pack and heads in USA)
monobloc studio flash unit with independent built-in power source (known as monolight in USA)
symmetrical generator power unit for two or more flash heads that only delivers similar powers to each head

Generators offer the convenience of being able to control flash output from one location; you can also check the charge status of each flash head from the generator. Monoblocs usually feature an audible beep to 'announce' when they are recharged, as you cannot always see the recharge lamp from all locations in the studio.

Be warned that studio flash may not operate as expected when you turn the power down. Electrical energy for a flash is stored internally in a capacitor circuit, which is fully discharged for each flash fired. For example, if you are working at a three-quarter power setting and choose to reduce the output to half power, the unit will have recharged sufficiently to fire at three-quarter power and will fire next time with that output, despite now being set to half power. Subsequent flashes will be at the lower power setting. You must remember to dump the excess power if you turn the unit down or the next image will be unintentionally overexposed.

Guide numbers are not commonly quoted for studio flash heads as the fitted reflector can have a great effect on output. Studio flash units are instead rated in **joules** or **watt/seconds** but even this can make comparisons difficult, as one 2000 w/s unit may be less efficient in converting that energy to light than a 2000 w/s unit of a different manufacture. Some manufacturers will rate their flash head in the rather confusing watt/seconds per minute – this takes into account the recycling (recharging) time of the unit and rates how many maximum power flashes the unit can deliver in the space of one minute. This may seem a rather arbitrary way of claiming high power outputs, but it has a practical aspect as many photographers will use **multiple flashes** for one exposure to achieve enough light to permit the use of small apertures. Professional flash meters will accumulatively measure multiple flashes for this very reason.

joule SI (Système International d'Unités – International System of Units) unit of work or energy
multiple flash build up exposure with series of flashes, possibly to be able to use a smaller lens aperture
watt/second unit of energy equal to one joule, often used to describe studio flash units, but misleading as it does not take into account efficiency of unit in producing light

Modelling lamps

It is difficult, if not impossible, to judge what a set will look like lit by flash. This is why flash heads are usually equipped with **modelling lamps**. These lamps – placed inside the ring of the flash tube – are either tungsten or tungsten halogen bulbs giving a continuous light that will look the same as the flash. They will also be affected by any light shapers used on the flash head in just the same way as the light from the flash tube. Flash lighting is judged using this continuous light. Proportional modelling lights can be run at half or full power, but will 'track' the flash power that has been set for each flash head and give some indication of how the final lighting arrangement will look. There is some degree of interpretation and experience required in their use, as they do not have the same crisp power that flash gives to the final exposure. However, their use is vital when it comes to seeing hotspots and unwanted reflections.

Infrared handsets are available with some flash systems, giving remote control over multiple flash heads up to 10 metres away. This enables the photographer remotely to adjust power levels and modelling lamp settings, as well as programme bracketing sequences. Some generators are now equipped with USB connectors that give computer control for lighting setup.

Tungsten modelling lamp at the centre of the flash tube of a Bowens Esprit monobloc.

Independent modelling lamp and flash power controls (5-stops range) on a Bowens Esprit monobloc; charge indicator lamp and flash dump button in between.

modelling lamp continuous light lamp usually set at the centre of the flash tube in a studio flash head to show effect of the light from flash itself, does not contribute to exposure, may be adjustable in proportion to flash output

Ring flash

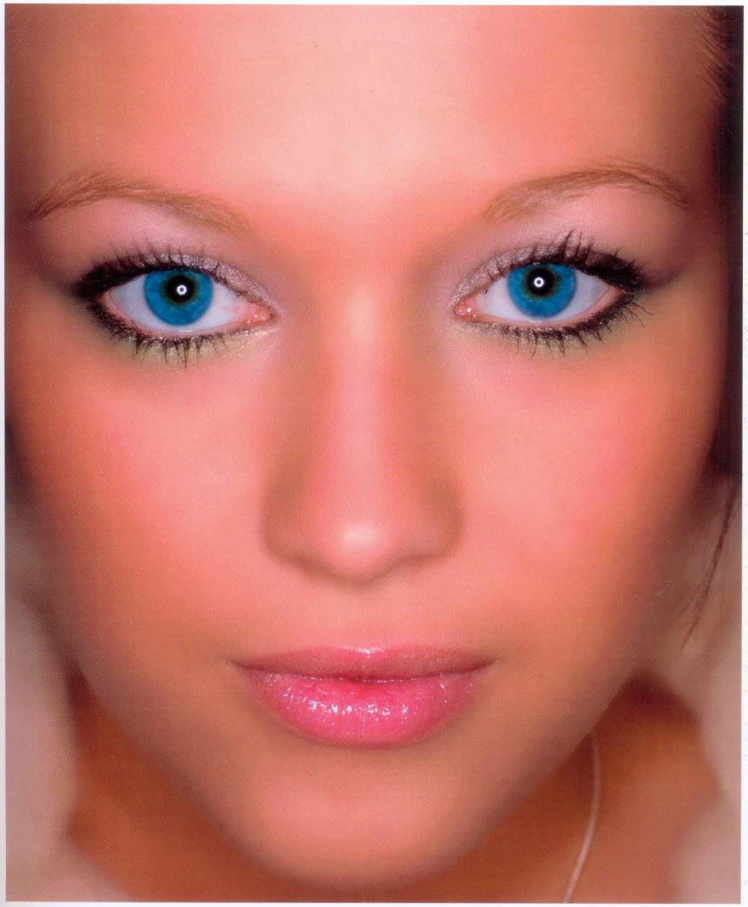
The **ring flash** is either a circular flash tube or a circle of segmented flash tubes that fit around the lens. It was originally designed for scientific close-up photography to give shadow-less images, but it has been adopted by fashion photographers to give flat lighting that leaves a tell-tale doughnut **catchlight** in the model's eyes. Because of the distinctive look it produces, its use in fashion photography is beginning to fall away. However, it remains a powerful tool for the macro or close-up wildlife and commercial stills photographer.

Studio ring flashes are often much bigger single-tubed units rather than the segmented tubes used in the so-called macro light for 35mm and digital SLR systems. Segmented ring flashes have one advantage in being able to produce some degree of modelling as well as producing direct frontal light. This is because the photographer has some element of control over the output of the individual flash tube segments of the ring. These are usually reduced to two curved left and right segments in the macro flashguns sold for 35mm and D-SLR cameras, which have individual power output adjustment.

A professional ring flash unit can deliver up to 3000 w/s of light and has fitments for the larger lenses of medium format cameras, as well as hard light reflectors and a diffuser.

Bowens ring flash with medium format camera.

catchlight bright reflection in the eyes of the subject in a portrait
ring flash circular flash unit that fits around the camera lens to give even, shadow free light. Some units made up of independently powered segments



Lauren (above)
On-axis ring flash gives this characteristic shadow-free lighting and a distinctive doughnut-shaped catchlight in the eyes.

Photographer: Colin Demaine.

Technical summary: Nikon D70, Sigma 50mm Macro, ISO 200 1/100 sec at f/8 with Sunpak ring flash. General retouching of blemishes using cloning and healing tools in Photoshop, overall skin appearance smoothed out, the eyes were given more life by painting colour into them.

Catherine (above)
Fill flash balances the natural sunlight to perfection, adds hair accents and provides some rim lighting so that the model's green top stands out from the similarly coloured background.

Photographer: Rod Edwards.

Technical summary: Mamiya 645 Pro TL, Mamiya 150mm prime lens, Fuji Reala ISO 100 colour negative film (rated at EI 64 for greater shadow detail), 1/250 sec at f/5.6 with polarizer to cut down the light, enabling a wider aperture to be used for shallow depth of field. Fill flash from softbox mounted on stand using Elinchrom Ranger portable location battery pack and head. Fill flash gave 1:1 ratio with daylight. Blue grad effect was also added to sky with Photoshop after scanning.

Fill flash
Flash can dominate an image even on a bright day, especially if the subject is close to the camera. When the flash power equals the ambient light, the ratio is said to be 1:1. A more natural look is achieved when the flash is one stop down (less bright) on the ambient light, which gives a 1:2 ratio. Even lower ratios of up to 1:4 are useful to add some fill into the shadows and bring down their colour temperature (warm them up). There are wedding photographers who always use a flashgun – even on bright days outdoors – simply to put a catchlight reflection in the subject's eyes. This will give life to a picture, even though the flash may be making little contribution to the overall exposure.

Some flashguns have flash power compensation and some cameras feature this in their built-in flashguns. The power can be dialled up or down – usually in half or third stop increments – to balance output to the subject. When set at 0EV (no compensation) many manufacturers' flashguns are too powerful and you might prefer the look of a lower power setting, especially for fill flash work.

Balancing light sources
The idea of balancing different light sources can mean one of two things. First, balancing the intensity of two sources (usually daylight and flash) to get a combined effect favouring one or the other or, second, the need to choose an appropriate white balance when light sources with very different colour temperatures are featured in an image (see also pages 26–7). As electronic flash and daylight have very similar colour temperatures, they are more easily combined than tungsten light and daylight.

The technique described here as 'fill flash' is sometimes called 'syncro sun'. Calculating fill flash can be done manually if you are working with a manual camera and flashgun. For example: you are using a sensitivity of ISO 200 or a film of that speed and the flashgun calculator suggests f/8 as the appropriate aperture for your subject at 3 metres. Using a hand-held light meter, take a reading of the ambient light, which suggests, for instance, a shutter speed of 1/125 sec if the aperture is f/8. This would give a 1:1 ratio between the flash and ambient light. To achieve the preferred 1:2 ratio the flash power needs to be reduced by 1 stop. Closing the lens aperture down to f/11 underexposes the flash by 1 stop, but to compensate for the loss to the ambient light setting the shutter speed must now be set 1 stop slower at 1/60 sec. It is for the ability to balance out flash at a range of shutter speeds that professionals prefer the leaf shutters in medium format camera lenses to the focal plane shutters in 35mm and most D-SLR cameras. Focal plane shutters are limited to flash sync speeds of between 1/60 and 1/250 sec because the first curtain has to fully clear the film before the second curtain closes and this limits the fastest speeds at which synchronisation can happen.

Shaping light

Reflectors

The word '**reflector**' is the term more commonly used for the silvered dishes fitted behind lamps to control and direct the light. The large **flats** are more usually referred to as '**bounces**'.

Almost any large surface can be used to reflect light. Large lightweight items are ideal. Foldaway reflectors are metallised or plasticised neutral-coloured cloth stretched on a spring frame. Expanded polystyrene boards (**polyboards**) tend to get used frequently in studios as they are cheap, lightweight and can be disposed of if damaged. It is best to cover them in white emulsion as, in their raw state, they can absorb a surprising amount of light. Reflecting boxes or elaborate walls can be constructed with polystyrene boards that are easily held together for temporary arrangements with bamboo or metal meat skewers and sticky tape. Reflective 'sentry boxes' for wrap-around reflected light can be quickly custom-built in this way.

Reflected light 'works' in just the same way as a main light source and obeys the inverse square law. If you want to double the effect of a reflector, move it in half as close again as it was originally. If custom reflectors cannot be found then improvisation will be called for. Any large piece of neutral-coloured card, a bed sheet or even a lightly printed broadsheet newspaper, can be draped to catch and reflect light.

Commonly, reflectors are a neutral white or silver, but gold reflectors can be used to warm up the reflected light – 'instant tan' in other words. Manufacturers seem to have reduced the strength of gold reflectors for digital capture and they now have only a hint of warmth in the reflected light. Coloured reflectors can be used judiciously but, if the reflector is out of shot, the viewer may be puzzled as to where the coloured light is coming from. Strongly coloured clothing gives this kind of effect, colouring the shadows under chins, which can be a problem if the image is later cropped.

The wrap-around reflector to outdo all other reflectors is the **tri-flector**. This is a three-panelled reflector with two 'wings' that can be angled to fold the light around the subject. Though Lastolite makes a collapsible version, many photographers have copied the three-panel reflector using polyboards. Even garden photographers have used similar reflectors made of card to wrap, yet control, the reflected light around a single flower head.

Studio bounces tend to be diffuse rather than specular (mirror-like) reflectors. (See pages 150–1 for more information.)

Main light without reflector

With white reflector

With silver reflector

With gold reflector

Softbox above and in front of the model

Softbox above and in front of the model with Tri-flector

bounce (verb) to reflect light back; (noun) a reflective flat (see flat)
flat large sheet of expanded polystyrene or foam core board (lightweight) used to reflect light or cast shadows
polyboards expanded polystyrene flats
reflector object that reflects much of the light that falls on it, usually white, silvered or gold coloured
tri-flector folding reflector with three surfaces; much used in portraiture

Cutters and flags

Cutters are the opposite of reflectors. The words '**cutter**' and '**flag**' tend to be used interchangeably, though cutters are really larger panels and flags can refer to something no bigger than a postcard. Any material that is opaque enough to cast a shadow can be used as a cutter, as this is the primary purpose of a cutter – to cut light. In other words, to prevent light falling where it is not wanted in the studio. With care about how the reflecting surfaces are angled, any reflector can double-up to prevent light falling where it is not wanted. However, to be true to the definition, a cutter should really be a large black-painted flat.

Still-life photographers worry a great deal about 'image forming light' – this is why they use bellows lens shades to cut out all stray light, thereby preventing lens flare that saps the image of colour saturation. Even with a lens hood, it is good practice to use cutters to control stray light – what photographers call '**spill**'. In anything but a perfectly black studio this 'spilled' light will find a reflective surface somewhere and contribute in an unwanted and uncontrolled way to the image. Looking at the flash synchronisation setup plan on page 93 you will see two large black-painted boards that prevent the light from the flash softbox from falling across the camera lens. The camera 'looks' through a narrow slot in between the two boards and this helps to prevent lens flare. The cutters here are used like a large directable lens shade.

In other setups the effect of a cutter will actually be seen in the image. Part of an image may need darkening down by cutting out the light from the main light source. A cutter, or cutters, would be used to darken a foreground and thus shift the emphasis to the more brightly lit background subject. Once the function of a black-painted board is to prevent reflections, rather than cast a shadow, it would more accurately be called a 'black bounce'. Sometimes, black bounces are used to emphasise the outline of a subject that is photographed against a brightly lit white background. This is achieved by placing them close on either side of the subject, just out of shot. So, whether a black-painted polyboard gets called a cutter or a black bounce depends on its function at the time.

cutter matt black painted flat (see flat) used to absorb light
flag piece of opaque material often mounted on a boom or arm used to block non-image forming light and reduce lens flare; can be used to control subject illumination
spill extra light that 'overshoots' the subject. It can be used on a background or reflected back on to the subject. May produce lens flare and needs to be controlled with barn doors on the lamp or flash head, flags or gobos

Without cutter and bounces

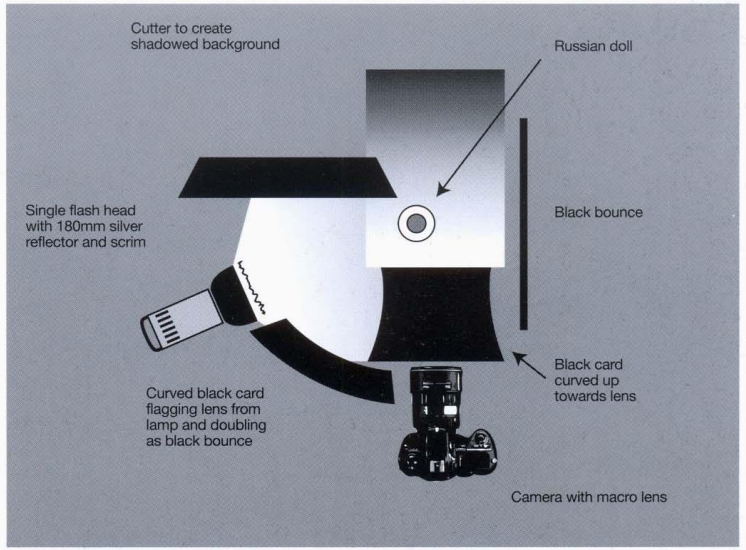
With cutter and bounces in place

Seasonal Russian doll (above)

Cutter used to create shadow in background and black bounces used to kill unwanted reflections on the shoulders of the doll and to increase colour saturation. Comparison image was taken in same lighting at same exposure but without cutters or bounces.

Photographer: David Präkel.

Technical summary: Nikon D100, 60mm Micro-Nikkor AF-D, 1/180 sec at f/27, ISO 200.



Backgrounds

Most studios offer simple black and white paper backgrounds. This is typically supplied in large rolls that are hung from a chain-driven wall or ceiling-mounted system. Some manufacturers produce pre-printed background cloths. These are usually a textured neutral patterning on a 'safe' blue or grey, sometimes with slight metallic accents.

Getting a perfect, evenly lit background requires long strip lights or lights facing away from the background bounced from large polyboard reflectors. When lighting the background directly you need to have the lamps on either side facing across the background to avoid hotspots. It takes a surprising amount of light to produce a bleached-out white background.

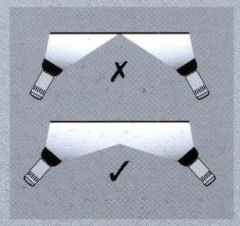
The 'infinity cove' is a permanent background, shaped and built into the studio to give a feeling of endless space. It is usually stark white and can be lit with coloured **gels**. The biggest cove can accommodate whole cars, but the look of the background stretching off to infinity can be done small scale with a paper background or the scoop of a still-life table.

'**Gobos**' (go-betweens), or '**cookies**' – as the smaller disks for spotlights are sometimes called – are one way of enlivening a background by casting patterns of light and shade. They come in a wide variety of patterns and pictures, ranging from the generally useful to the downright tasteless. Strips of torn cardboard or crumpled **scrim** hung in front of a lamp may be all that is needed to add interest to a solid-colour background.

More flexible but less easy to control are projection systems. The old 35mm slide projector can give a brightness and intensity of light not easily matched by digital projectors, but the background scene or pattern has to be available as a 35mm mounted transparency.

There is a growing tendency to follow the motion picture use of digital 'green screen' or 'chromakey' techniques. A colour not normally encountered in the real world – a vivid blue or green – is used as a background into which a scene can be digitally composited. It can seem an attractive and quick solution – the difficulty for the stills photographer is to keep coloured reflections off the main subject and to create convincing perspective and lighting effects so foreground and background merge seamlessly.

Lighting a background evenly



Building lighting

The simplest studio lighting for portraits is with just one lamp; this closely imitates the natural look of sunlight. (The ideal single light for portraiture is the so-called **northlight** window – a window lit by a bright sky.) Lighting from the front illuminates the face evenly and gives a 1:1 lighting ratio across the face. Look at the images on pages 104–5 and 134–5 where ring flash (or **axial lighting**) and front lighting have been used. Both sides of the face are evenly lit.

As soon as you begin to move the light away from the front and at an angle to the subject (see the diagram and images on page 120–1) you will begin to model the face with a combination of shadows and highlights – in other words, the face takes on a more three-dimensional appearance. If there is no light reflected back into the shadowed side of the face this creates the very dramatic look of **split** lighting. So-called because it splits the face down the centreline of the nose into a lit side and a dark side (see image opposite).

The ratio of light across the face can be adjusted by throwing light back into the shadows using either a reflector or a second lamp. The principal source of light is the main or **key light**; this secondary source – because it fills the shadows with light – is called the fill light. The main light is the dominant light and casts the most important shadows. Its distance depends on the type of light and the highlights it creates. The height of the light is judged by the length of shadow beneath the nose; too high will unflatteringly light the forehead, too low will look flat and cause the sitter to squint their eyes. Younger and feminine faces respond best to lower contrast lighting of 1:2 or 1:3 (one and a half stops) ratio. Higher ratios suit rugged or more masculine faces.

Lighting ratios

3 stops 1:8 f/4 f/11

2 stops 1:4 f/5.6 f/11

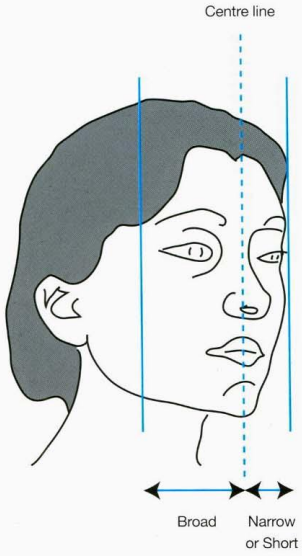
1 stop 1:2 f/8 f/11

axial light light from a source as close as possible to the optical axis of the camera lens, usually a ring light, that produces flat, shadow-free lighting
key light main light source
northlight area light or softbox imitating the look of a north-facing window (lit by indirect daylight and Northern Hemisphere only)

Controlling light

Portraits – one light, three-quarter lighting
Lighting that comes from an angle of 45° relative to the centreline of the head is called three-quarter lighting. It can come from camera left or right (see diagram on page 121). This lights one side of the face well, yet puts enough light on to the shadowed side of the face to model it.

Portraiture is the art of bringing out the character of the individual sitter. Because we are not taking images for the purposes of official identification, sitters do not need to face squarely on to the camera. A portrait photographer would naturally encourage a sitter to turn his or her head towards or away from the camera (after the inevitable conversation about which is the 'best side'). This makes one side of the face appear wider than the other. These are referred to as the broad and short or narrow sides of the face. This is where the two variants of three-quarter lighting get their names: broad lighting and short lighting. With broad lighting, the main light is on the side of the face turned toward the camera; with short lighting, the main light is on the side of the face turned away from the camera. These two types of lighting can be used to alter the look of the width of the sitter's face. A narrow face can be made to look wide with broad lighting (easy to remember).



Square to camera

Short lighting (main light only)

Short lighting (main and fill light)

Broad lighting (main light only)

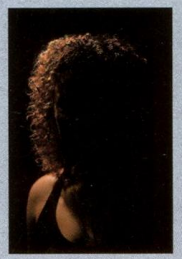
Broad lighting (main and fill light)

More than one light

If you flick through any book on lighting you will find elaborate setups using many flash heads or light sources – 11 was the most I found. These arrangements may seem bafflingly complex, but not if you break down the function of each light and realise that photographers sometimes use banks of light that act as one.

The most important light is the main or key light; its qualities (whether it produces hard or soft light) will be chosen to suit the subject and its direction and height chosen to cast the main shadows and provide the desired modelling effect. The fill can come from reflectors or a fill light/or lights. This puts a controlled amount of light into the shadow areas that have been created by the main light to reveal some detail. The fill light reduces the lighting ratio and controls the contrast in the image.

Effects lights are those used to pick out particular features or details. In portraits, it is quite common to use a snooted light on a high stand, well behind and well above the sitter on the opposite side from the main light. This puts a highlight into the hair, which helps separate the sitter from the background. The background itself – if it is not to be black – must be lit. This is the function of background lights, which are often used in banks and sometimes additionally reflected off bounces to achieve an even spread of light. A projection spotlight may be used to throw images or patterns on to the background using gobos (cookies).



Effects light (hair light) only

Main light only

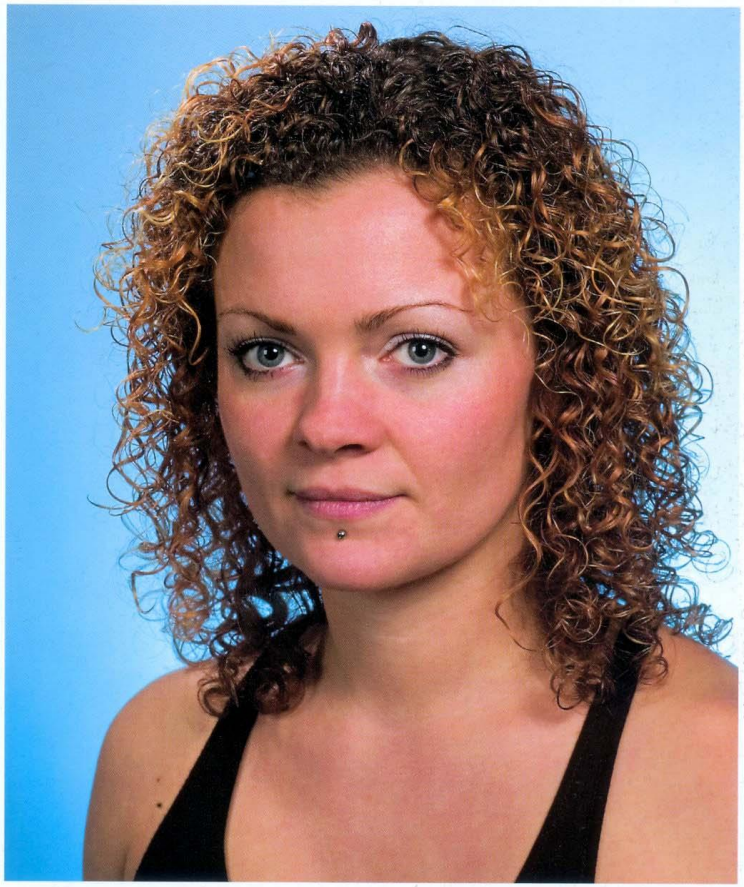
Background light only

Fill light only

Halo lighting

Using a strong light directly behind the sitter's head creates a halo of light through the hair and makes the subject stand out dramatically from the background. This is usually achieved using a snooted light placed behind the sitter so it cannot be seen from the camera position. The width of the beam is adjusted to just cover the back of the head.

effects light a small light – neither the key light nor fill light – used to illuminate a small portion of the subject, often a mini spotlight. Sometimes known as FX light



Bianca (above)

Classic portrait lighting using main light to create modelling, fill light to moderate shadows created by main light, effects light on hair and background light to create coloured background.

Photographer: David Präkel.

Technical summary: Nikon D100, 60mm Micro-Nikkor AF-D, 1/180 sec at f/16, ISO 200, four Bowens Esprit 1000 flash heads – main light beauty dish, fill light 75x150cm softbox, snoot on effect light and blue gel on background.

Rembrandt lighting

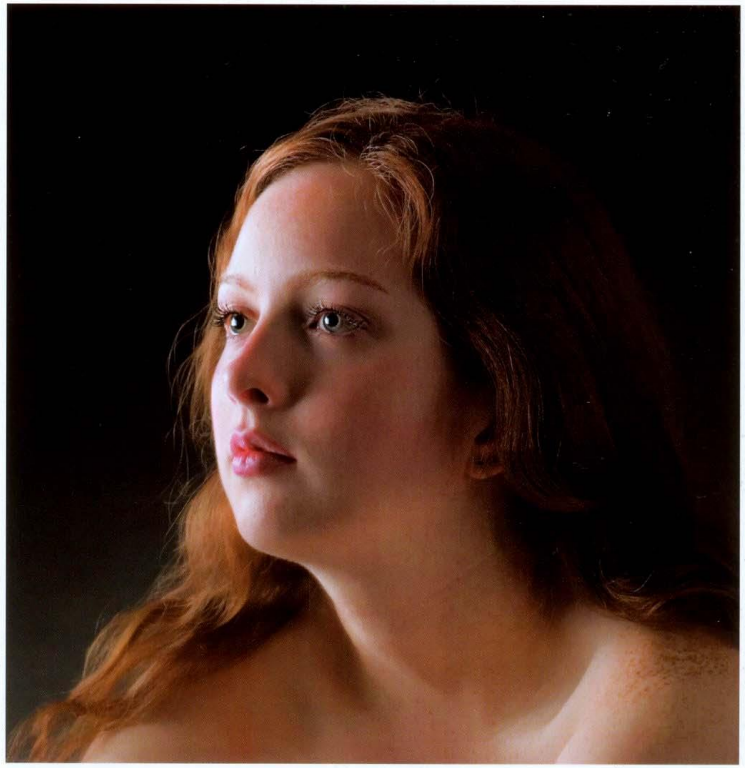
Rembrandt lighting is sometimes referred to as 'Old Master' lighting. It is the lighting from a single source as seen in some of Rembrandt van Rijn's (Dutch painter and engraver 1606–69) paintings that is its inspiration. There is probably more to be learned from looking at how Rembrandt handled light in his paintings than from any number of books on lighting technique.

Just as the use of butterfly lighting can be identified by the distinctive shadow under the nose, Rembrandt lighting can be distinguished by a small triangle of light under the eye on the broad side of the face. Some photographers actually call the triangular patch of light 'a Rembrandt', which the purists will say should not be wider than the eye socket or longer than the nose. As with all lighting arrangements, what looks good on the day with a particular face should dictate, rather than arbitrary 'rules'.

Unusually, with Rembrandt lighting it is the narrow side of the face that is lit; the side of the face turned away from the camera. The light fills this side of the face and spills over the arch of the nose to catch the cheekbone and cheek on the broad, shadowed side. Lighting the narrow side of the face concentrates the light in a smaller area and dramatically emphasises the outline of the side of the face against the background. The lighting also highlights and models the nose, though care has to be taken over camera height and angle for models with larger than average noses.

Without fill light, Rembrandt lighting is a highly dramatic lighting style, best suited to sitters with a strong bone structure. Fill lighting can modify and soften the drama while retaining the overall quality and direction of the lighting. The fill lighting can, of course, be supplied either by a reflector or by a second diffuse light source, such as a softbox or umbrella. Just as the height of the main light in butterfly lighting is adjusted using the nose shadow, so the height and angle that the main light strikes the sitter is adjusted for Rembrandt lighting by observing the triangle of light on the cheek.

Rembrandt van Rijn Self portrait c. 1660–63 (oil on canvas) (left)
The distinctive triangular patch of light is under the artist's left eye.



La fleur divine (IV) (above)
Modified Rembrandt lighting gives an exquisite painterly effect.
Photographer: Eric Kellerman.
Technical summary: Large 75x150cm softbox, with **eggcrates** to photo left at angle of 30° below the sitter. Large polystyrene bounce photo right inclined towards sitter, parallel to plane of softbox. Light sunk behind, and hidden by the sitter, illuminates the background paper.

eggcrates interlocking cloth grids for use on softboxes, work to pool the light as a honeycomb does on a bare bulb

Butterfly lighting

'Butterfly' lighting is a style of glamour lighting using high frontal main and fill lights, almost in imitation of strong summer sun. The Hollywood sun and glamorous associations of the style are echoed in the other name sometimes used to describe this lighting style – 'Paramount' – after the film studios of that name. This was the kind of lighting used to create the front-of-house publicity pictures for movie stars and starlets.

The name 'butterfly' comes from the distinctive butterfly-shaped shadow that appears beneath the nose and extends someway down the top lip of the model. The appearance and shape of this shadow can be used to position and balance the lights that create this distinctive and appealing look. It is a beauty or glamour style of lighting best suited to women, as it emphasises the structure of the face. Because of the high angle of the lighting, this will lay emphasis on the eyes and cheekbones with highlights.

Butterfly lighting is usually quite symmetrical and it can be difficult sometimes with floor standing lights to place the camera, fill and main lights in the necessary vertical array. Lamps on a high-glide system give the photographer space to work beneath them where stands could get in the way. If the lights are skewed to one side, the 'butterfly' will appear lopsided and the lighting loses its glamorous qualities. If the lights are positioned too high and the shadow lengthens too much down the top lip, again the effect is lost. A simple reflector can be substituted for the fill light. While it is possible to use a reflector below the main light to fill some of the shadows, the shadow under the nose must remain visible for the look to be successful.

It is not usual to light male models in this way as the high lighting can unflatteringly emphasise the forehead, especially if the camera is at or above the model's eye height. It can also unnaturally highlight the ears in both men and women whose hairstyles do not cover their ears, while the butterfly shadow can look absurd on men with beards or moustaches.

Routledge (facing opposite)

The butterfly shadow on the top lip beneath the nose gives away the high frontal lighting for this model portfolio shot – here the light has been lowered so as not to give dark shadows in the eyes and the strong single light source has not been softened with fill light as it would be to give a softer, more glamorous effect. A strong under-chin shadow has been filled with a little reflected light but retains a masculine strength.

Photographer: Rod Edwards.

Technical summary: Mamiya 645 Pro TL, 150mm Mamiya lens, 1/125 sec at f/8 Fuji Reala transparency film, Elinchrom flash head.