photography

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foundation course

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What is a camera?

Essentially, a camera is a closed box with a strip of light-sensitive film on one side of the interior and a hole opposite to admit light from a subject. With the exception of the most basic pinhole cameras, all cameras have a lens, which allows you to focus on a specific part of a scene and to take pictures of subjects at different distances from the camera. There is also a light meter in the camera to tell you how much light is reflecting back from the subject so that the film receives just the right amount of exposure. And finally there is an integral viewfinder that allows you to see the subject from the camera's point of view.

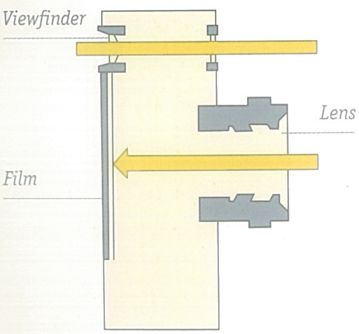
Film cameras

Direct-vision viewfinder

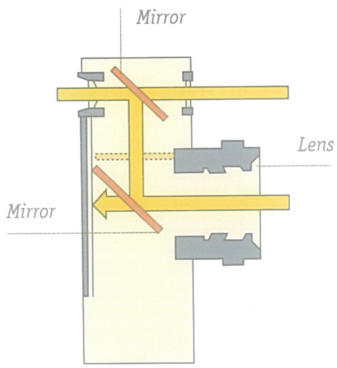
The direct-vision viewfinder design is neat and compact. It has a separate viewfinder window towards the top of the camera body, just to one side of the lens, that gives you a direct view of the subject. These cameras are primarily aimed at amateur photographers and most modern types feature autofocus lenses. Although these are not particularly flexible cameras, they are capable of good results under a range of standard lighting conditions.

On some good-quality cameras there is a second, 'rangefinder', window linked to the focusing mechanism. This system allows you to see when the subject is in focus when looking through the rear eyepiece. The most famous of these cameras is the Leica rangefinder, which also accepts a range of interchangeable lenses.

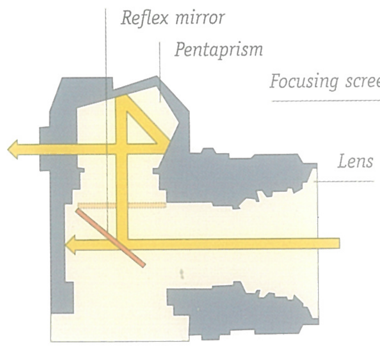
Light paths through the camera



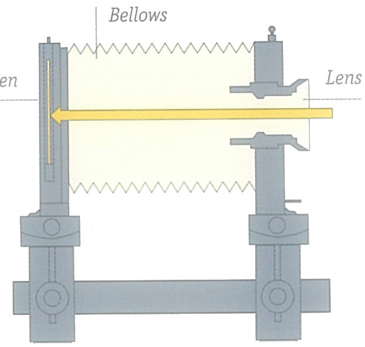
In a simple direct-vision viewfinder camera you view the subject through a window above the lens.



In a rangefinder camera two views of the subject are combined and appear sharp in the viewfinder when the lens is in focus.



In an SLR camera light from the lens is directed up into the viewfinder, so you always see exactly what the picture will be.



In a view camera light enters the lens and, when a darkslide is removed, exposes an individual piece of sheet film.

Pinhole imagery

The camera that produced this picture (see also pp. 124–7) did not even have a lens – instead, a tiny pinhole-sized aperture focused light from the subject onto a piece of printing paper. The shutter, a wooden panel on the front of the camera, is swung aside manually to allow light to enter. As the aperture is so tiny, about only f256 (see pp. 16–19), the normal shutter speeds of fractions of a second are more likely to be several seconds long with this instrument. At the end of the manually timed exposure, you must swing the shutter closed once more. As you can see here, the image from a pinhole camera does not have the definition and clarity you would expect from a modern camera lens.

SLR

With the single lens reflex, or SLR, camera light from the subject travels through the lens, into the camera body, where it is reflected upwards by a reflex mirror into a pentaprism, the interior surfaces of which are also mirrored. From here, the light is reflected out through the rear eyepiece. This complex arrangement allows you to see an image correctly orientated in all respects (correcting the upside-down image produced by the lens and the laterally reversed image reflected by the reflex mirror). The SLR design, both 35mm and medium-format types (see pp. 24–7), is a very accurate way of viewing the subject, as when you look through the eyepiece you see the actual image produced by the lens. And every time you change lenses, or settings on a zoom lens, the image in the viewfinder remains accurate.

Large format

Large-format cameras are not commonly seen outside of the professional studio. With these, a flexible bellows connects the lens panel to a ground-glass focusing screen at the rear. To increase contrast and so make the image on the screen easier to see, it is common to use a black cloth to shade the screen and cover your head. A single sheet of large film is then slid into position and exposed.

Any camera lens will project an upside-down image, but this type of camera does not offer any correcting aids. It is a painstaking way of working and suitable only when accurate photographic enlargements of the finest quality are required.

Digital cameras

Entry-level digital cameras are largely automated, easy to use, and have direct-vision viewfinders. But, like their film-camera equivalents, SLR digitals generally offer better results under a more varied range of lighting conditions.

The optical side of digital cameras is very similar to that of film cameras, but rather than the light being directed to a strip of film, it falls on a light-sensitive electronic sensor known as a CCD (charge-coupled device). The CCD is made up of a grid of minute cells, each sensitive not only to the intensity of the light falling on it, but also to its colour. Each cell of the CCD transmits the light and colour characteristics of its part of the picture to a central processing unit (CPU), where an electronic file of the whole image is created and recorded on a memory card.

Memory cards have a finite capacity and the higher the resolution of the recorded image, the fewer images can be accommodated. Because of this, digital cameras give you the option of saving pictures, or image files, in a compressed fashion. The higher the rate of compression, the more images the memory card will hold, but the poorer will be their quality. Set the quality of the file for its intended use. For example, a highly compressed file might be suitable for a website, while an uncompressed image might be required for big enlargements. Memory cards can be downloaded into your computer or a more portable hard-drive device, the files deleted, and the card loaded back into the camera for reuse.

Digital image quality is dependent on the number of pixels (the basic digital picture element) per image the CCD can record – the more, the better. Entry-level cameras may have only 1- or 2-megapixel (millions of pixels) capacity, but 6-megapixel cameras are now commonly available, and even SLR models are becoming more affordable all the time.

Apertures and depth of field

The lens aperture is the size of the opening in the lens through which light reaches the film. A series of overlapping blades can be adjusted via a ring on the lens or, more commonly today, a button on top of the camera, to alter the size of the opening in a series of 'f-numbers'. The choice of aperture, along with shutter speed (see pp. 20–3), is crucial not only to correct exposure, but also to the degree of image sharpness. While you are composing the picture through the viewfinder the aperture stays wide open, giving you the brightest possible image to look at, but it automatically closes down to the preselected f-number when you fire the shutter.

Apart from the effect changing apertures has on exposure, whenever you make the aperture smaller or larger you alter the zone of sharpness within the image. This zone of acceptably sharp focus, known as 'depth of field', extends both in front of and behind the point actually focused on.

Factors affecting depth of field

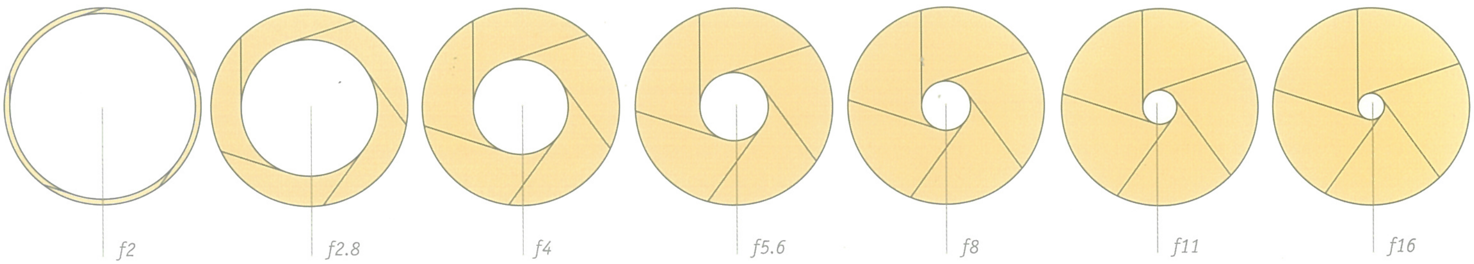
Depth of field is not fixed. In fact, there are three main factors that determine its extent. First is lens aperture (see below): the smaller the aperture (denoted by larger aperture numbers), the greater the depth of field. Therefore, f2 (a wide aperture) will have an inherently shallower depth of field than, say, f16 (a small aperture).

The second factor affecting depth of field is lens focal length: wide-angle lenses produce an inherently greater depth of field than normal or telephoto lenses. Therefore, a 135mm telephoto lens will give pictures with a shallower depth of field than a 28mm wide-angle.

The final factor affecting depth of field is the focus distance of the subject. The further away you focus the lens from the camera the greater the resulting depth of field. Therefore, a lens focused at 1m (3ft) from the camera will produce a shallower depth of field than that same lens, set at the same aperture, focused at just 3m (10ft) from the camera.

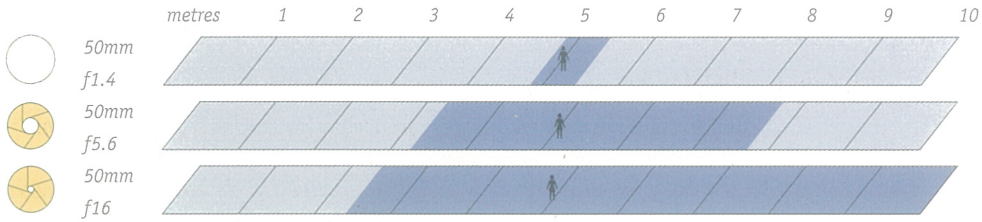
Controlling exposure

The sequence of apertures shown below is that typically found on camera lenses. You can see that the larger an aperture's f-number, the smaller the actual opening. Each time you alter the aperture by one full setting, or 'stop', you either halve or double the area of the opening, and so halve or double the amount of light transmitted by the lens. In other words, changing the aperture from f4 to f5.6 halves the amount of light reaching the film; changing it from f4 to f2.8 doubles the amount of light getting through.



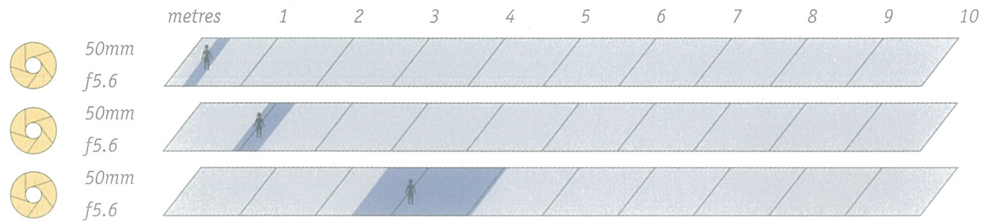
Altering the lens aperture has two effects on the photograph. First, as described opposite, it changes the amount of light reaching the film and so is a factor in exposure. Second, each time you stop down (make the aperture smaller) you increase the depth of field within the image. In these diagrams you can see that changing the aperture from f1.4, through f5.6, to f16 has an enormous affect on the amount of the image that would be sharply rendered (represented by the darker shade of blue). The lens remains the same each time, as does the focusing distance (represented by the figure) of the lens.

Changing aperture



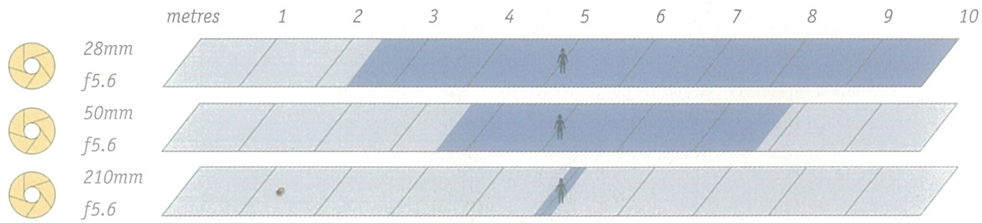
Changing the focusing distance of the lens, while keeping the aperture the same (at f5.6), also affects depth of field, though to a lesser extent. These diagrams show that the closer the subject being focused on is to the lens, the shallower will be the depth of field.

Changing focusing distance



The third major factor affecting depth of field is the focal length of the lens. In these diagrams, the aperture is set at f5.6 each time and the focusing distance is constant. But as you can see, the 28mm wide-angle lens has an enormous depth of field, while that of the 210mm telephoto is very shallow. Accurate focusing becomes more of an issue as depth of field decreases.

Changing focal length



TIP

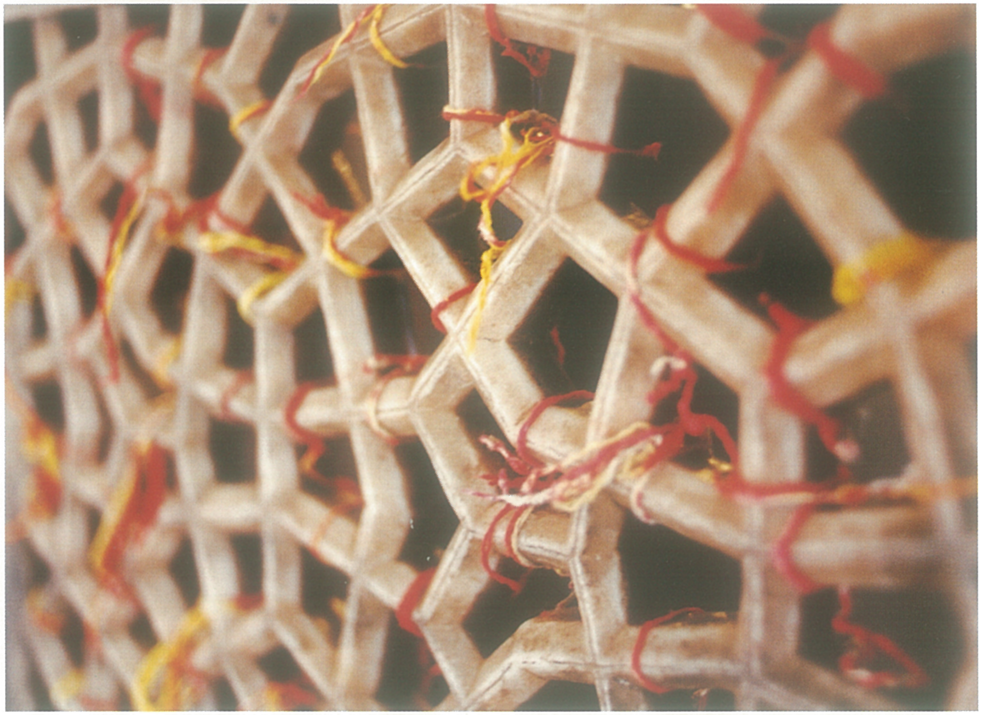
Portrait and reportage photographers often use middle-range apertures, such as f8 or f11, for optimum image quality. Some image distortion is possible with either extremely small or extremely large apertures, though except on very poor lenses any distortion should be only slight.

Selective sharpness

This set-up amply illustrates the creative potential of depth of field. In the first image of the pair (near right) the 55mm lens was set at f5.6 and focused on the central black jug, but the zone of sharp focus at this aperture does not extend even a few centimetres, so the foreground mug and background jug are rendered softly out of focus. This is ideal if you need a technique to isolate a subject from, say, cluttered surroundings. In the next shot (far right) the aperture was stopped down to f22 and now depth of field amply covers all three objects, though the shutter speed had to be changed to compensate for the reduced amount of light passing through the lens (see pp. 20–3).

Selective emphasis

Once you have come to terms with the pictorial effects that changing apertures has on the image, you can apply the technique in all manner of situations. In this photograph, showing a pierced stone screen in an Indian temple, a telephoto lens with the aperture wide open at f4 and focused as close as the lens would permit has produced a shallow band of sharp focus and so emphasized this one small part of the image area. The coloured threads, each representing a prayer from a devotee, add to the abstract nature of the shot.



Creative factors

Given the right combination of circumstances – say, a 135mm lens set at an aperture of f4 and focused at 1.2m (4ft) – depth of field could be so shallow as to make it impossible to render sharply all of a person's face, unless it's in profile. Move in closer still, to the close-focusing distances of the macro world, and it might be impossible to show all of even the smallest garden flower in sharp focus.

Traditionally, landscape, still-life, and architectural photographers have manipulated depth of field by using apertures of f22 or smaller to give sharp images from the immediate foreground right through to the far distance, or infinity (the ∞ symbol on the lens focusing ring). A more modern trend, however, is to limit depth of field in order to isolate specific subject elements or to force the viewer's attention on to a specific area of the image.

Deceptive distances

Although depth of field here appears to be extremely shallow, what you cannot see from the angle the picture was taken is that the front rank of sunflowers was separated from the rest of the field by a wide ditch.

Shutter speeds

As light passes through the lens aperture (see pp. 16–19), a shutter opens to allow it to reach the film or, with a digital camera, a CCD sensor (see p. 15). So, by controlling the length of time the shutter remains open, you have the second half of the exposure equation: intensity x time. The intensity of the light from the subject is determined by the size of the lens aperture, while the length of time that intensity of light is allowed to act on the film or sensor is determined by the shutter speed.

As a guide to helping you choose the 'correct' exposure – in other words, the right combination of aperture and shutter speed – all modern cameras have a built-in light meter. To do its job accurately, the light meter not only has to read the overall light reflecting back from the main subject and its surroundings, it also has to take into account the speed of the film loaded in the camera (see pp. 34–5), or the sensitivity setting of the CCD sensor.

TIP

To avoid camera shake with a 35mm camera, set the shutter speed closest to the focal length of the lens. With a 50mm lens use 1/60 sec; with a 135mm lens use 1/125 sec; with a 200mm lens use 1/250 sec; and so on. For speeds slower than 1/60 sec, use a tripod or some other support to guarantee sharp images.

Creative blur

With a shutter speed of 1/8 sec it was possible to capture the excitement and energy of this dancer by recording all movement as blur. To prevent camera shake spoiling the effect, the camera was tripod mounted.

Recording movement

Not only does shutter speed help to determine exposure, it also affects the way the subject is recorded. For example, if you select a shutter speed of 1/125 sec then you are likely to 'freeze' such subjects as people walking or jogging, or cars travelling at moderate speeds. That same shutter setting, though, is unlikely to freeze the movement of a speeding train or sprint runner. But don't fall into the trap of thinking that subjects always need to be recorded with clinical sharpness – by deliberately selecting a slow shutter speed you can record subject blur and so produce what may be a more evocative and appealing image.

Another way to record subject movement is to 'pan' the camera. Using this technique, you move the camera to keep the subject in the same area of the frame while the shutter is open and the image is being recorded. Thus, the subject remains relatively sharp while all the background and stationary parts of the scene become elongated into streaks and blurs. For the most dramatic results, choose a slow shutter speed – say, 1/15 sec – as the faster the shutter speed, the less the background will blur.

Deliberately creating subject blur as a means of interpreting subject movement is very different from the type of blur caused by camera shake.

Sharp and blur
Although a shutter speed of 1/15 sec was not enough to halt the movement of this speeding train (above right), by supporting the camera on a convenient wall it was possible to ensure that all other parts of the scene were recorded pin sharp.

A new perception
A shutter speed of 1/4 sec was used to photograph this rapidly flowing stream (right), giving us the opportunity to perceive water in an entirely new way.

Most of the pictures we take we want to be clear and sharp, so try to keep the camera perfectly still as you gently squeeze the shutter release button. Jabbing down sharply on the shutter release will cause the camera to dip just as the image is recorded and results will nearly always look like a mistake.

Shutter types

Different camera formats can have different designs of shutter. For example, 35mm cameras have what is known as a focal plane shutter inside the camera body, situated just in front of where the light from the lens comes into focus. Most medium-format cameras have a 'leaf' or 'bladed' shutter built into the lens (the exception being the Pentax 6 x 7cm, which has a focal plane shutter). Large-format cameras also have a bladed shutter in the lens; while the basic pinhole camera has a shutter in front of the lens in the form of a wooden lens cap that you swivel across by hand after a manually timed period.

The focal plane shutter consists of slatted metal blinds on spring-loaded rollers. The significance of this is that at shutter speeds faster than, on most 35mm cameras, about 1/250 sec, the blinds are not all open at the same time and the image is recorded as a slit moving in front of the film or sensor. Knowing this becomes important when using accessory electronic flash or studio flash (see pp. 36–7), which can produce an intense burst of light as short as a mere 1/10,000 sec in duration. Unless this light fires when all the blades are open, part of the image will not be recorded. To avoid this problem occurring, most manufacturers of 35mm cameras have a flash-synchronization shutter speed of 1/250 sec or slower. The flash-synchronization setting on camera controls is often denoted by a lightning bolt symbol or an X.

The leaf shutter found in medium-format camera lenses opens and closes somewhat like a lens aperture, and no matter what shutter speed is set the shutter is either fully open or fully closed. This means that electronic flash will synchronize with any shutter speed. The disadvantage here is the extra cost of including a built-in shutter in each lens.

Contrasting moods
The contrast between the calm interior of this train carriage and the trackside foliage outside hurtling by outside is immediately striking. Fill-in flash was used to light the interior, so countering the green colour cast that would have resulted from the fluorescent tubes, and a shutter speed of 1/30 sec creates the effect of blur outside.

Aperture numbers	*f1.4*	*f2*	*f2.8*	*f4*	***f5.6***	*f8*	*f11*	*f16*	*f22*	*f32*
Shutter speeds (sec)	*1/1000*	*1/500*	*1/250*	*1/125*	***1/60***	*1/30*	*1/15*	*1/8*	*1/4*	*1/2*

Exposure alternatives
If your light meter indicates that an aperture of f5.6 and a shutter speed of 1/60 sec is the correct exposure, then all the other combinations of settings on this chart will give the same overall exposure. What does change is the depth of field and the way any movement is recorded.

Shutter lag

A potential drawback with many cameras, but especially some digital models, is known as shutter lag. This is the delay between the time when the shutter release is pressed and the image is actually recorded. This problem is caused by the processing time the camera needs to record each image. It is most obviously a concern with the more basic and inexpensive digital models, where shutter lag can be very noticeable. This rules these cameras out whenever the timing of the shot is crucial – as it would be for any type of action or sports photography, for example. With good-quality digital compacts and SLRs, however, shutter lag should not represent a problem.

Frozen movement

There is no right or wrong way to record movement. To freeze the movement of these two leaping red lechwe, southern African antelope, the photographer used a shutter speed of 1/1000 sec on a 400mm lens. Here you can see them in almost clinical detail. An equally valid, though totally different, approach to the subject might have been to set a shutter speed of only 1/30 sec and then panned the lens as they passed the observation point.

Camera and film formats

The term 'format' refers to the shape and size of the film used in a camera and to the camera itself. The most popular format by far is 35mm, and these cameras are generally easy to handle, versatile, and capable of excellent results. When even better images are required, larger films are made for what are known as medium-format and large-format cameras.

TIP

Magazine or book layouts are often based on 35mm proportions, so if you shoot with a square format, your image may have to be cropped. The medium-format camera with film proportions that are closest to those of 35mm is the 6 x 4.5cm.

In past times the classic Box Brownie was the favourite camera not just for taking family snaps, but also for recording images of travel to far-flung places. Many wonderful family histories have been recorded by this medium-format camera's relatively simple lens. A very recent camera favourite is the Lomo, a 35mm-format, point-and-shoot compact. Although its controls are limited, it has caught the imagination of those wanting to take spontaneous, good-quality images.

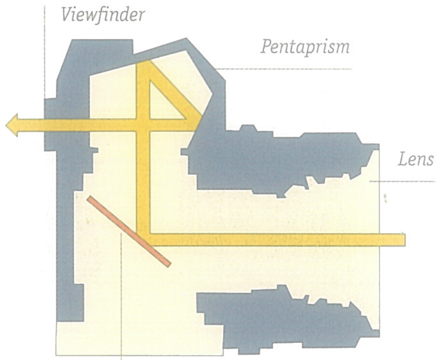
35mm format

In the 1920s an employee of the famous Leitz optical company in Germany developed a new camera format by utilizing 70mm movie film sliced down the middle to give 35mm-sized images. The camera he invented was, of course, the world-famous Leica (short for Leitz camera), a model that has influenced the course of photography.

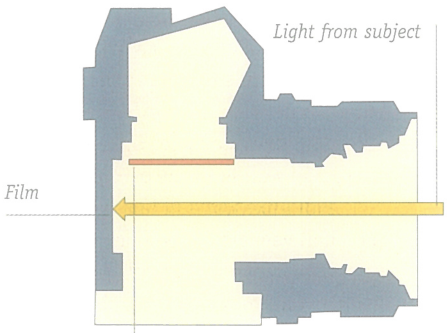
Many of the best-known photo-journalists have used Leica rangefinder cameras, favouring their unobtrusive size, near-silent shutter, and their ability to accept a range of lenses over the features on offer from more high-tech, larger, and often noisier camera types.

Many people have become interested in photography as a result of using a basic 35mm direct-vision compact camera. For straightforward purposes, these cameras offer the potential for good results. Even though you cannot change lenses, many come with useful zooms, but they make decisions about aperture and shutter speeds you are unaware of and have no control over. For about the same price as a good compact you can buy an entry-level single lens reflex (SLR), and immediately you have a range of exposure options, through-the-lens (TTL) metering, interchangeable lenses, and accurate viewing and subject framing via the reflex mirror and pentaprism.

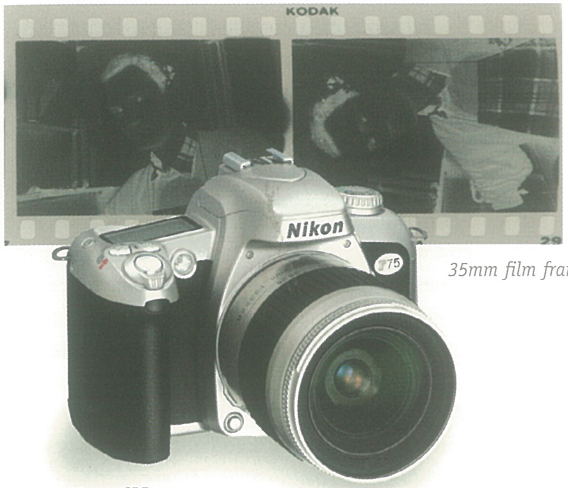
With an SLR camera in viewing mode (near right) light from the lens enters the camera body where it is reflected upwards by a 45° mirror into the top-mounted pentaprism. From here, mirrored surfaces reflect the light out through the rear eyepiece. When the shutter release button is pressed, the camera is in picture-taking mode (far right): the aperture shuts down to its preset value, the reflex mirror flips up (blanking out the viewfinder), and the shutter opens to allow the light to reach the film or processor. With most film cameras, the film is then wound on ready for the next shot.



Reflex mirror in viewing mode



Reflex mirror in picture-taking mode



35mm film frame

35mm SLR

35mm compact

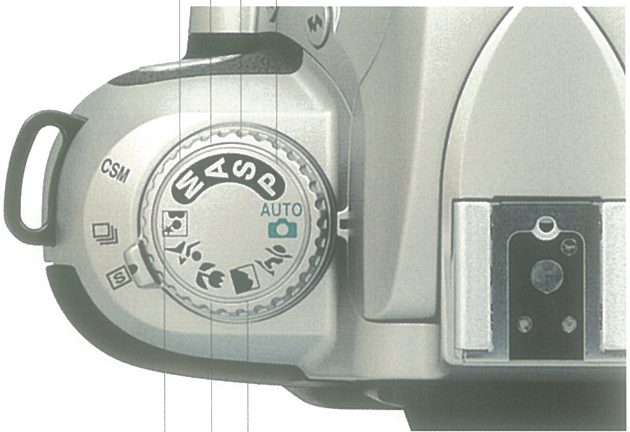
One of the famous 35mm Leica rangefinder cameras

M is for Manual. Requires you to set the shutter speed and aperture yourself, according to information from the light meter.

A is for Aperture priority. You choose the aperture and the camera sets the shutter speed automatically.

S is for Shutter priority. You set the shutter speed and the camera sets the aperture automatically.

P is for Program mode. The camera sets both the shutter speed and the aperture.



Distant program

Middle-distance program

Close-up program

X or a lightning bolt is the symbol for flash synchronization and, unless an accessory flash gun is attached, any built-in flash will be used if this symbol is selected. If you buy a dedicated flash that relates specifically to your SLR camera, it will automatically monitor light reflecting back from the subject and so prevent overexposure.

Medium format

Medium-format cameras use 120 or longer lengths of 220 film. However, this format includes a range of cameras, both SLR and rangefinder in design, that produce different-sized film originals, but all based on the same 6cm-wide film.

For example, the smallest and most 'compact' design of camera in this format is the 6 x 4.5cm. Next up in size is the square format 6 x 6cm camera, which is a film size made famous by the Hasselblad camera. Then come 6 x 7cm and 6 x 9cm models. There are other, less popular sizes within this medium-format category, the most interesting being the panoramic 6 x 17cm. The larger the area of the film frame produced by each type of camera, the fewer the shots that can be taken on each roll of film.

These cameras remain popular with professionals because their large image size, compared with 35mm (see p. 25), gives excellent results when enlarged. Although smaller 6 x 4.5cm and 6 x 6cm models can be hand-held if reasonably brief shutter speeds are employed to prevent camera shake, all medium-format SLRs lend themselves to being tripod-mounted when in use.

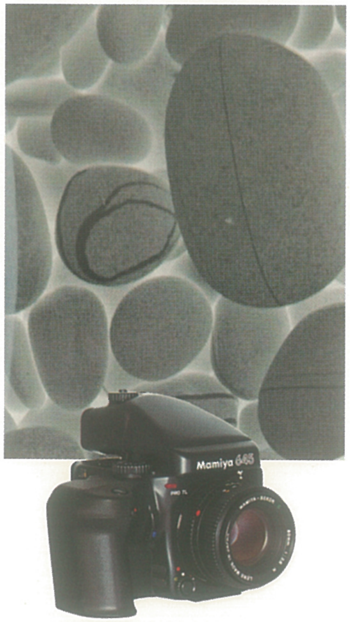
There are lightweight rangefinder models for many of the medium-format camera sizes, and these are an excellent choice for a whole range of photographic situations when high-quality images are essential yet the camera must be hand-held.

Many of the SLR 'system' models have separate film backs that can be replaced with digital-imaging backs.

Large format

This camera format is used only when images of the highest quality are required. Rather than rolls of film, such as 35mm cassettes or medium-format 120 or 220 rollfilm, these cameras use single sheets of film measuring 5 x 4in (12.7 x 10cm), 7 x 5in (17.75 x 12.7cm), or 10 x 8in (25.4 x 20.3cm). Not only does this film size ensure excellent enlargement quality, film processing can also be tailored to suit the needs of each individual image, as each is on a separate sheet of film. With a 35mm cassette or a rollfilm, all images on that film receive identical processing.

Large-format cameras are available in two basic designs – monorail and field models. Monorail types must be mounted on a tripod and



6 x 4.5cm SLR and film frame

6 x 6cm SLR and film frame

6 x 7cm SLR and film frame

are nearly always used in the studio, though they can be used outdoors for static subjects such as architecture and landscape.

Field cameras, though still large, shut down into a box and are relatively easy to carry on location. In appearance, they are similar to the type of press camera used in the 1940s and 50s. Once opened, a lens panel attached by bellows to the focusing screen and film holder slides forward.

Many 'art' photographers work with large-format cameras because of the quality they offer, especially with the current trend towards limited editions of very large (and expensive) colour prints. But even if you never intend to own such a camera, if you ever get the chance to use one, even for a few hours, it is an experience not to be passed up.

Digital cameras

In the main, digital cameras look like their film-camera counterparts, especially SLR and compact models, although there are some unusual designs available – some useful, others simply novel. At present, cost is still the main factor holding back the popularity of the more professional digital SLR formats, though prices are coming down all the time. Special digital backs are available not only for medium-format cameras – there are also large-format studio-camera backs capable of recording images comprising 8,000 x 10,600 pixels, making nearly 85 million pixels, or megapixels, in total. The drawback here (apart from price) is that such an image could take in excess of 3 minutes to record, thus restricting the types of subject they can be used for.

6 x 9cm rangefinder and film frame

5 x 4in camera and sheet film

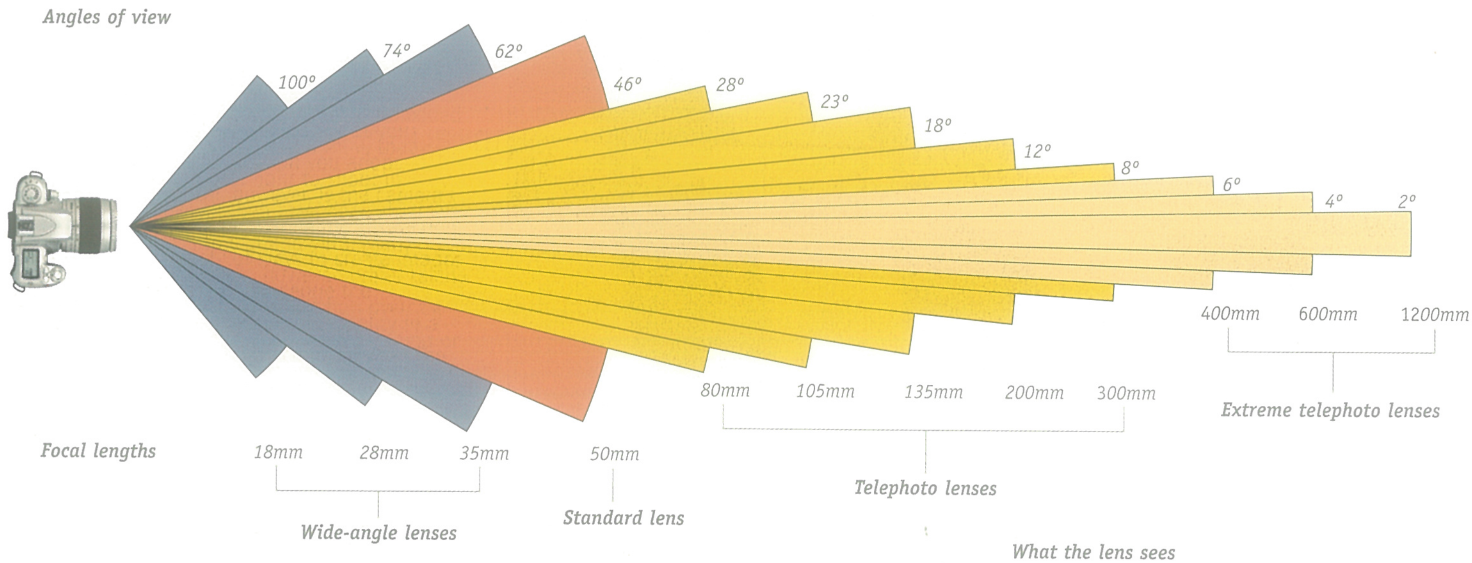
Lens types

The degree of subject enlargement produced by a lens determines the type of lens it is. For example, a 'standard' lens produces a subject enlargement roughly corresponding to our unaided eye, while a telephoto lens produces an enlarged view of a scene, and a wide-angle a reduced view. As the focal length of a lens increases, however, its angle of view, or the amount of the scene it can encompass, becomes narrower and narrower.

TIP

Be careful about dust getting into digital SLR cameras as it can be amplified in the picture. When changing lenses hold the camera body upside down. Some people recommend not changing lenses at all, especially if you have a zoom that covers all your needs.

Digital cameras do not produce a physical image, so there is nothing that can be measured to determine the degree of subject enlargement. Instead, the focal length of lenses for digital cameras is calculated in reference to the image sensor size and is quoted as an 'efl', equivalent focal length, to the 35mm format. For example, the standard lens for the Nikon D70 6-megapixel camera is about 35mm. The Nikon digital zoom lens of 18–70mm for the same camera is about the equivalent focal length of a 24–90mm zoom on a 35mm camera.



What the lens sees

The angle of view of a lens for any particular format depends on its focal length. This diagram shows the angles of view of a wide range of lenses for the 35mm format.

Focal length

Every time you change lenses or the settings on a zoom lens you produce a different degree of subject enlargement. A 200mm telephoto will give you an image more than seven times larger than a 28mm wide-angle. However, the 74° angle of view of the wide-angle will encompass far more of the scene than the telephoto's mere 12°.

Apart from changing angles of view, using a different focal length lens can produce a very different image perspective. For example, wide-angle lenses tend to open out the different subject planes of an image, so that the foreground, middle ground, and background all appear very distinct and well separated. In addition, a wide-angle lens used very close-up to a subject's face is certain to produce image distortions – enlarging the nose more than the forehead, for example, which is positioned slightly further away from the lens.

A telephoto lens tends to give what is often described as a 'squashed' perspective, resulting from the fact that the background is enlarged in relation to the foreground and so appears to bear down on it.

Zoom lenses have variable focal lengths, most often within the range 28–80mm or 80–200mm. Some zoom lenses bridge the wide-angle and telephoto categories with focal length ranges of approximately 28–200mm.

Wide-angle perspective
A wide-angle lens (above right) imparts a particular look to a photograph. Foreground elements appear enlarged compared with more distant parts of the subject and the image planes (foreground, middle ground, and background) look well separated.

Telephoto perspective
A long lens produces this typically 'squashed' perspective, with the background bearing down on the foreground.

Autofocus problem
Most autofocus systems favour the centre of the screen. As you can see in this image, the lens has focused on the background and rendered the real subjects as a blur.

Autofocus solution
With an off-centre subject, move the camera so that the subject is centre frame, focus the camera (usually by half depressing the shutter-release button), lock the setting, and then recompose the picture before shooting.

Lens 'speed'

Lenses are often referred to as being 'fast' or 'slow'. The speed of a lens depends on its widest aperture setting – the wider it is, the faster the lens is said to be. For example, a lens with a widest maximum aperture of f2.8 is slower than a lens with a widest maximum aperture of f1.2 or f1.4. The design of fast lenses is difficult, especially if image quality is to be maintained, and this is reflected in the price.

There are two principal advantages in having a fast lens. First, a wide maximum aperture allows you to shoot in low light conditions while using a conveniently brief shutter speed. If your lens opens up to only f5.6 (common with many telephoto zooms), you might have to use a shutter speed of 1/30 sec to achieve the correct exposure in some conditions. In those same conditions, a lens with a maximum aperture of f2.8 would allow you to use 1/125 sec.

The second advantage of having a fast lens is that with SLR cameras the brightness of the image in the viewfinder depends on the speed of the lens – the wider the maximum aperture, the brighter the image you see to focus on.

Manual or autofocus

Many cameras have a switch that changes focus from automatic to manual. In autofocus mode a motor in the camera moves the lens in and out until it determines the subject is in focus. This is useful if you need eyesight correction but find glasses difficult to wear when using a camera. But there are problems. For a start, you need to know where the system assumes the main subject will be in the viewfinder, because that is where it focuses the lens. If your subject is, say, off-centre (most autofocus systems assume the subject is approximately in the middle of the frame), then you may get a wonderfully clear image of the background and an out-of-focus foreground subject off to one side (see left).

Another possible problem arises when shooting through a window – some systems may focus on the glass rather than the scene beyond.

The third potential problem with autofocus systems is noise – the motor can be noisy when moving the lens back and forth, making them unsuitable for some wildlife photography or when you don't want to draw attention to yourself or to the presence of the camera.

Zoom lenses
While it is possible to find fixed focal length lenses for every need, many people favour zoom lenses, whose variable focal lengths cover a range of settings. The wider the range of focal lengths covered, the more difficult it is to maintain image quality, especially at the extremes of the zoom range.

28-70mm zoom

80-200mm zoom

28-200mm zoom

200-400mm zoom

Zoom movement

By setting a reasonably slow shutter speed – say, about 1/15 or 1/30 sec – and zooming the camera lens while the shutter is open, you can produce explosive-looking images even when the subjects are completely static. Try to keep the camera as steady as possible so that camera shake does not mar the effect of the zoom movement.

Specialist lenses

When extreme close-up photographs of exceptional quality are required, special macro lenses are available. These lenses are expensive to buy, but they have been designed especially to give their best results when they are focused far closer to the subject than would be possible with non-specialist lenses.

The problem of converging verticals is something most photographers encounter at some stage. This occurs when the camera is tilted upwards to include the top of a tall building or monument. Using a PC (Perspective Control) lens you can keep the camera (or, more importantly, the film or sensor) square-on to the subject while shifting the lens elements up to 'slide' the top of the subject into view. As with macro lenses, PC lenses are too expensive to buy unless your work demands them, and it might be better to consider hiring a lens of this type for occasional use.

Fisheye lenses are extreme wide-angles – so extreme, in fact, that they can give a circular, 360° view (thus including yourself taking the picture in the frame). It is hard to image anybody wanting to use this type of lens very often, so you must decide if the expense is justified.