

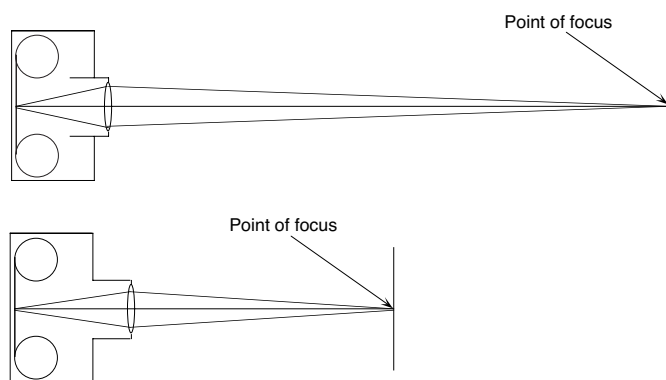
Back to basics

Focus and exposure

by Peter Rowlands

FOCUS

Most lenses can be adjusted to alter the point of focus. This is usually done by rotating the barrel of the lens to move the internal elements in relation to the film. The further away the lens is from the film, the closer the point of focus will be.



A good example of this is with extension tubes on a Nikonos where the 35mm lens is placed further away from the film by putting an extension tube between the camera body and 35mm lens.

With reflex cameras you can see the changing effect in the view-finder but with non-reflex cameras you have to estimate how far away you want the point of focus to be and set the lens accordingly.

As we will see later, there are additional criteria which make the exactness of the point of focus much less critical.

EXPOSURE

There is little point in having a sharp subject if the film is incorrectly exposed. The correct exposure is achieved by choosing the right combination of shutter speed and aperture.

Shutter speed

The camera body has a shutter which can be controlled to give varying amounts of time which it is open.

A basic shutter like the one in a Nikonos 111 camera (see diagram below) consists of two blinds A & B. In Position 1, the film is covered by Blind A. When the shutter release button is pressed, Blind A moves up and exposes the film to light (Position 2). The second blind (B) follows after a set time depending on the shutter speed selected and covers up the film again (Position 3).

When the shutter is cocked, both blinds move down without exposing the film and are held in position ready for the next exposure.

For simplistic purposes it is assumed that the time taken for each blind to move is insignificant.

The amount of the delay between Blind B following Blind A determines the “SHUTTER SPEED”.

The faster the shutter speed, the less light arrives on the film and vice versa.

Common shutter speeds are expressed in fractions of a second and range as follows:

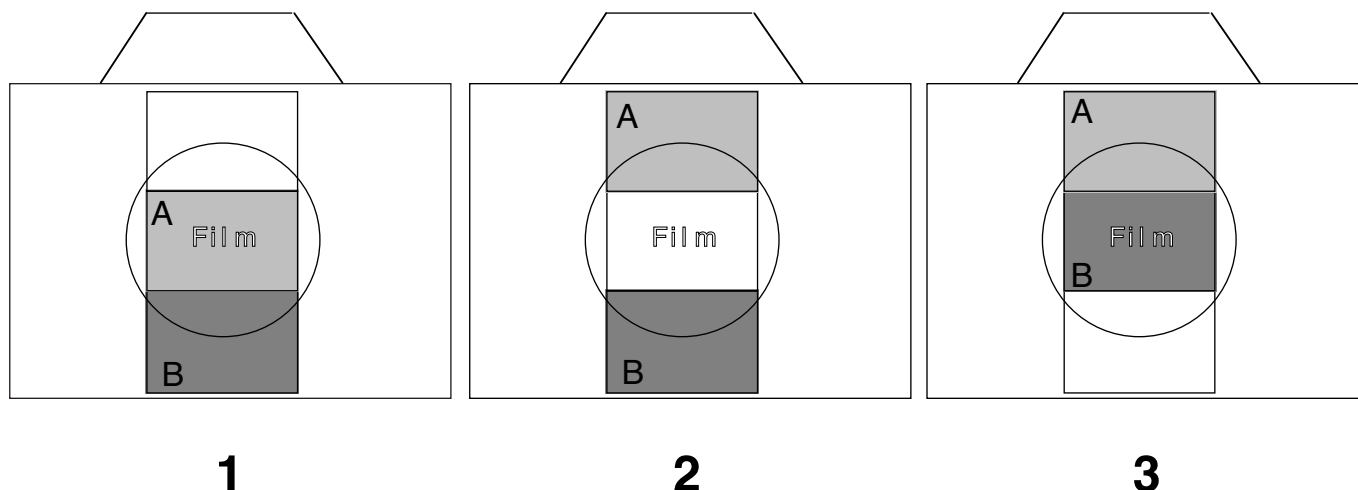
1/30th of a second

1/60th of a second

1/125th of a second

1/250th of a second

1/500th of a second



There is an important relationship between each shutter speed in that, for example, 1/125th is twice as fast as 1/60th so half as much light falls onto the film and vice versa.

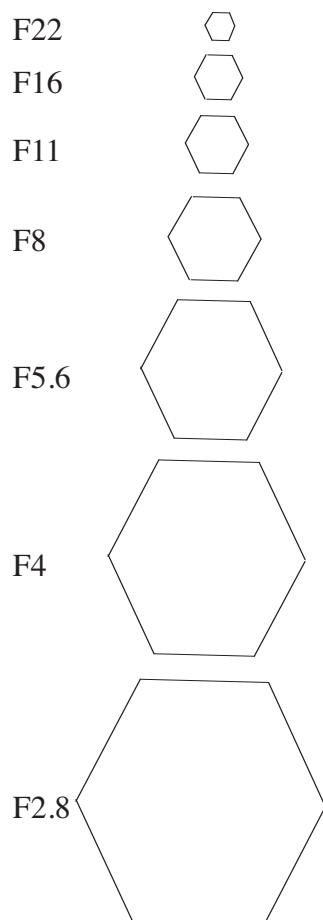
Aperture

The aperture is a mechanical device built into the lens and is basically a hole, the size of which can be controlled. The larger the hole, the more light gets onto the film during the exposure.

For the sake of simplicity, the aperture sizes are designated in “**F STOPS**” - the numbers actually relate to the diameter of the aperture divided into the focal length of the lens and normally range as follows:

F2.8, 4, 5.6, 8, 11, 16 and 22.

The smaller the number, the larger the aperture and vice versa.



The relationship between each aperture is known as “**STOPS**”. Changing the aperture from F5.6 to F4 opens it up 1 stop, doubles the size of the aperture and so doubles the amount of light getting onto the film. This is referred to as “**OPENING UP A STOP**”. Going the other way from F4 to F5.6 halves the size and also the amount of light and is referred to a “**STOPPING DOWN A STOP**”.

Some lenses have intermediate settings to allow control of the aperture in half stops for greater exposure accuracy and most recent cameras offer more intermediate settings for even greater accuracy.

COMBINING SHUTTER SPEED AND APERTURE

As said before, the correct exposure is achieved by choosing the right combination of shutter speed and aperture.

This is done by establishing the light level with either a hand held light meter or one built into the camera. These devices measure the amount of available light and give a reading which is a combination of shutter speed and aperture. On a hand held meter a dial shows what aperture to use if you want to use a different shutter speed than that indicated.

Let’s assume the given combination of shutter speed and aperture to achieve correct exposure is:

1/125th shutter speed and Aperture F8

The same amount of light will fall on the film if the shutter speed were halved to 1/60th and the aperture were stopped down

one stop to F11 to compensate for the extra amount of light falling on the film. The following list will all give exactly the same amount of light on the film:

1/30th	F16
1/60th	F11
1/125th	F8
1/250th	F5.6
1/500th	F4

Mixing any of these combinations will result in incorrect exposure.

The effect of changing shutter speed

The faster the shutter speed, the more you will be able to “**FREEZE**” the action and get sharp results of fast moving subjects. With slower shutter speeds you will have to hold the camera steadier to get sharp results.

As a rough guide to the slowest speed you can use when hand holding a camera, the speed will be the reciprocal of the focal length of the lens. For example with a 35mm lens the slowest sensible speed would be 1/35th sec i.e. 1/30th and for a 135mm telephoto it would be 1/135th sec i.e. 1/125th.

The effect of changing aperture

Changing aperture produces a much more important effect and is often fundamental to achieving sharper results overall.

For simplicity’s sake we’ll assume that, at Aperture F2.8, only the subject focused on will be sharp. Stopping the aperture “**DOWN**” will bring more into sharp focus either side of the

main point of focus and will give the advantage of not having to be too critical about the exact point of focus. This increased focus area is known as **“DEPTH OF FIELD”**.

Here is a typical depth of field chart for a 35mm lens focused at 2 metres:

<u>APERTURE</u>	<u>MIN</u>	<u>MAIN</u>	<u>MAX</u>
F2.8	2	2	2
F4	1.6	2	2.8
F5.6	1.5	2	3
F8	1.4	2	3.5
F11	1.3	2	5
F16	1.2	2	10
F22	1	2	Infinity (∞)

Note how the focus range increases as the aperture is stopped down.

The range of the depth of field varies with the focal length of lens being used - the wider the angle of the lens, the more the depth of field so focusing is much less critical.

The effect of using different film

In order to achieve correct exposure you have to take the speed of the film into account. The faster the film, the quicker it reacts to light and vice versa. Common film speeds are:

50 asa
100 asa
200 asa
400 asa

Just as with aperture and shutter speed, there is a relationship between the film speeds in that 100asa is twice as fast as 50asa so 100asa is ONE STOP faster than 50asa and vice versa. For example, if the correct exposure for 100asa is 1/125th @ F8, it must be altered to 1/125th @F5.6 for 50asa (or any combination which achieves the same amount of light).

EVERY ALTERATION MUST BE COUNTERACTED

If you want to change any of the exposure settings, you must counteract the change in order to retain correct exposure.

If you want increased depth of field you “STOP DOWN” the aperture but must compensate by slowing down the shutter speed to let more light in but this might result in subject blur.

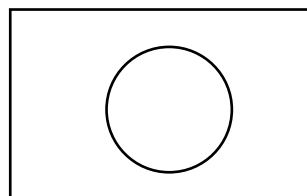
If you want to freeze the movement of a fish you will need to use a fast shutter speed but will have to “OPEN UP” the aperture to compensate. This in turn will limit the depth of field so you will have to be extra careful with the focus.

Exposure meters and light readings

The precise level of available light is best measured by using a light meter. This can be either a hand held meter or one built into the camera.

Fortunately, light levels underwater are fairly consistent in that the light is diffused but care should be taken when taking a light reading to make sure the correct exposure is achieved.

There are three main types of light metering systems:

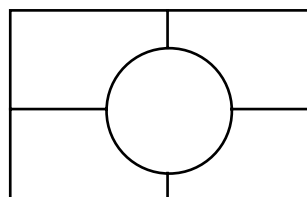


Centre weighted

This is the most common and is similar to that in the Nikonos 1Va and V cameras. As the

name implies, the meter takes more into account from the centre of the frame than from elsewhere and this does suit the majority of subjects underwater. The usual weighting is 75% from the centre circle of the frame and 25% from the rest of the area.

With this sort of system, care should be taken when the sun or any brighter area is in the frame as it may fool the system into thinking there is more light available than there actually is and this will result in under exposure. In this case tilt the camera slightly down or away from the bright area but still include some of it and this should achieve a correct exposure. With an automatic camera this is not practical as you will be pointing incorrectly so you will have to take a reading with the camera pointed down, note the reading and set the camera controls manually.



Matrix metering

This form of metering, and derivations of it, works by splitting the frame into sections

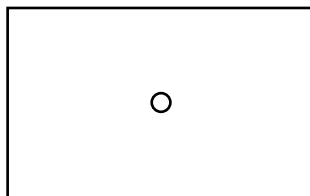
and takes each of these into account. This tends to be more accurate than centre weighted.

In the case of Nikon SLRs and Nikonos RS, matrix metering the frame is divided into 5 sections

and each section is taken into account. The meter then averages out all of the 5 separate readings to arrive at a correct exposure.

With this form of metering, bright areas will be taken into account and should not fool the system as much as with centre weighting.

Spot metering



As the name implies, the meter cell reads only the light from a very small part of the frame.

This is ideal for critical exposures of certain areas but is not really practical to use with automatic cameras as the readings could well be inaccurate for the rest of the frame.

This system is best used with the camera on manual.

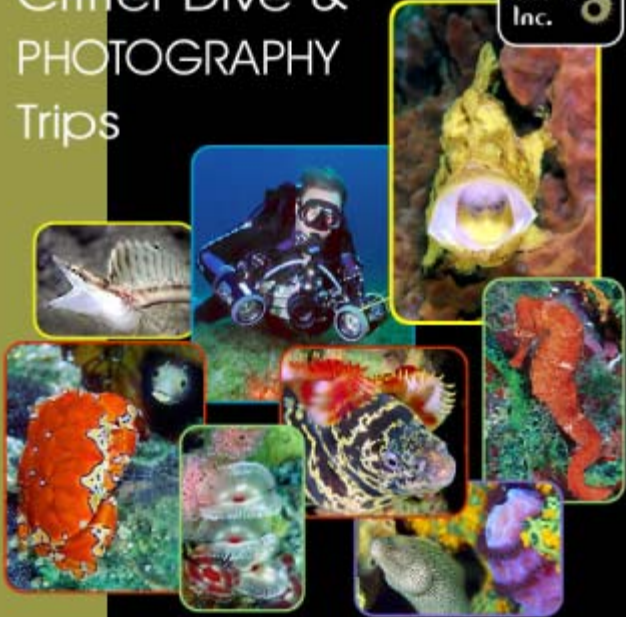
Well, that should give you enough to ponder on and absorb. In the next issue, we'll look at close up photography and see how easy it is.

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For more information call Ocean Optics.



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Web site

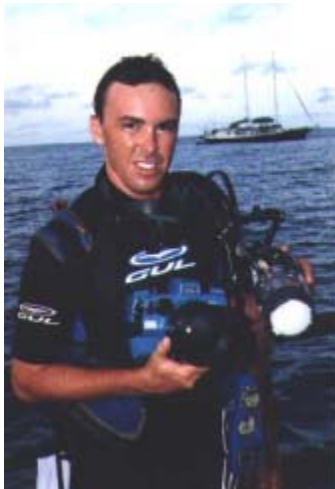
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Ever considered that the closest your dealer ever came to product training was to read a brochure? It's a sad fact that many people selling underwater camera equipment don't understand it - or even take underwater pictures themselves.

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Meet Andrew Bell.

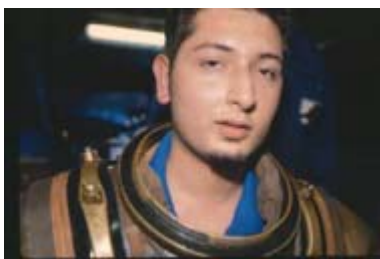


Andrew's been taking underwater pictures for fifteen years. In his home waters of British Columbia he has produced his own four part television series for cable TV. And he's one of the very few cameramen in the World to have filmed the mysterious and elusive six gill shark.

So when we were considering the revolutionary Quad Flash, it was Andrew who got to evaluate it. And where better than on an Ocean Optics sponsored workshop with the legendary Kurt Amsler? Because without Andrew's approval, the Quad wouldn't have made Ocean Optics' product line up.

And if you didn't see much of Andrew last April, it's because he was in Redang, Malaysia, trying out the Olympus digital cameras with the new Inon flashguns and lenses. With Ocean Optics paying his way.

Sid Thakers seen his work published in Dive



International, The Financial Times and The Independent. Sid's a prolific photographer and a founding member of Young Underwater

Photographer's. His work experience - Subal housings in tow - was on board the Liveaboard Coral Queen observing early filming of "Blue Planet". At Optics expense.



AJ Pugsley is the guy you'll meet most Saturdays or when Andrew or Steve's away shooting. AJ was first in the water with the superb Nikon F100 Subal housing and Subtronic Alpha Pro flashgun. He was photographing Raggie Tooth sharks on Aliwal shoal, South Africa. And again, Optics was paying. AJ's first shots were published and he's since gone on to win the first European Our World Underwater Photography Scholarship at Antibes. With a portrait of a Great White shot on nothing more than a Bonica point and shoot camera.

Why do we do this?

Because at Ocean Optics we believe you should talk to an accomplished underwater photographer with a portfolio. Not an accomplished salesman with a brochure.

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Underwater Photography

a web magazine

Guidelines for contributors

The response to UwP has been nothing short of fantastic. We are looking for interesting, well illustrated articles about underwater photography. We are looking for work from existing names but would also like to discover some of the new talent out there and that could be you!

The type of articles we're looking for fall into five main categories:

Uw photo techniques -

Balanced light, composition, wreck photography etc

Locations -

Photo friendly dive sites, countries or liveaboards

Subjects

Anything from whale sharks to nudibranchs in full detail

Equipment reviews -

Detailed appraisals of the latest equipment

Personalities

Interviews with leading underwater photographers

**If you have an idea for an article,
contact me first before putting pen to paper.**

My e mail is peter@uwpmag.com

How to submit articles

To keep UwP simple and financially viable to produce we can only accept submissions by e mail and they need to be done in the following way:

1. The text for the article should be saved as a TEXT file and attached to the e mail

2. Images must be "attached" to the e mail and they need to be:

Resolution - 144dpi

Size - Maximum length 15cm i.e. horizontal pictures would be 15 cm wide and verticals would be 15cm.

File type - Save your image as a JPG file and set the compression to "Medium" quality

This should result in images no larger than about 120k which can be transmitted quickly. If we want larger sizes we will contact you.

3. Captions - **Each and every image MUST have full photographic details** including camera, housing, lens, lighting, film, aperture, shutter speed and exposure mode. These must also be copied and pasted into the body of the e mail.

Peter Rowlands