DIGITAL PHOTOGRAPHY

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THERE'S NOTHING QUITE LIKE THE THRILL OF BUYING A NEW ELECTRONIC GADGET, ESPECIALLY ONE THAT'S AS MUCH FUN TO USE AS A CAMERA. IN THIS ARTICLE WE LOOK AT LENSES, OPTICS AND CAMERAS TO HELP YOU TO UNDERSTAND HOW THE PHOTOGRAPHIC PROCESS WORKS AND THEREFORE GET THE MOST FUN AND SATISFACTION FROM YOUR CAMERA.

I estimate that taking photographs underwater is at least three times as hard as taking above water shots. First, there's the marine environment with currents, cold, limited visibility and physical limitations inherent in diving. Then there are the mechanical problems of taking a camera underwater while still allowing you to access the camera's buttons and bits, usually with gloves hindering the process. Add to that the inevitable reduction in light, colour and clarity while shooting underwater and you have a process that can be very, very frustrating.

SO WHAT CAN MAKE IT EASIER FOR YOU ? Assuming you're going to be using a digital camera in a housing, which most of you will, then you should choose a housing and camera that keeps the photographic process as simple as possible. Choose a camera that lets you focus, change settings and view your results without having to push more than one button at a time. Both manual and auto control is a definite advantage, as is a large LCD screen to view (and also compose on some models) your photographs. Check for shutter lag – the time between pressing the button and the actual image capture should be almost instantaneous. Any noticeable delay will mean missed or mis-framed shots. Recent models have reduced or eliminated shutter lag, so be fussy when choosing your camera.

Time to write the image data to your camera's card is not usually a problem underwater as flash recycle time will limit the number of continuous photos you can take. If that's important because of your subject matter (dolphins, whales, shark feeds and other action situations) then you'll probably be choosing an SLR (Single Lens Reflex) camera which will have a high frame-per-second drive and a corresponding fast data exchange rate. Some older digital SLR cameras, such as the Nikon D100, made you wait until all the images taken in a burst were written to the card before you could take another series of shots. The newer models have fixed that frustrating problem – but check before you buy.

ACTUAL IMAGE AREA Divers know that even in the clearest visibility it's difficult to get a crisp image due to suspended particles in the water. The solution to that problem is to get close to your subject and use a wide angle lens. Only sad photographic fanatics, such as my friend Tony Wu, use anything longer than a 100mm macro lens underwater and even then at very close distances. While most landlubber wildlife photographers think that 'life starts at 300mm', we lesser diving mortals have to be content with wide, super wide or fisheye lenses to photograph anything larger than a poodle. Unless you've won the lottery or sold at least one kidney, the average diver will not buy a top-of-the-range SLR with a full size sensor chip, but will buy a digital camera with a sensor chip smaller than the standard 35mm frame. That means the same wide angle lens used with a digital sensor will be capturing a smaller area of the image circle cast upon it by the lens. If you read the fine print in your camera manual, they may give you a magnification factor to work out how 'wide' your wide angle lens will be with that particular camera. A factor of 1.6 – 1.3 is common. Therefore, a 20 mm lens will suddenly be a less-than-satisfactory 32mm lens (20 x 1.6 = 32) and your whizz-bang 18mm may be little more than a 28mm lens equivalent.

To illustrate this, imagine a torch shining a round beam onto a sheet of paper on which a rectangle has been drawn that is 24 x 36mm. The beam represents the image circle that a lens will throw back into your camera's guts which is designed to fit snugly around a 35mm frame measuring 24 x 36mm. Now draw in another rectangle that is 15 x 23mm. That much smaller rectangle is the size of a sensor chip (they do vary a lot but that size will do for this exercise). Your camera is recording is a much smaller area, effectively making your wide angle lens 'longer'.

Your very, very expensive 14mm rectilinear lens will now be effectively a very, very expensive 20mm lens. To solve this, manufacturers have invented another lens for you to buy – now you can get zoom lenses starting at 10-12mm focal lengths to allow you to grab back what a film camera is already providing. The initial problem is obvious; you need to fork out more money to get back what you previously had with a film camera. Less obvious is that you may be left with a lens that will be of no use once they start making cheaper sensor chips that will be the normal 35mm film size, an inevitable and desirable situation for underwater wide angle shooters. Canon have already brought out a full size chip camera that's designed to be the cheaper cousin to its top of the line full chip camera. Nikon and the others will follow. Caveat emptor.

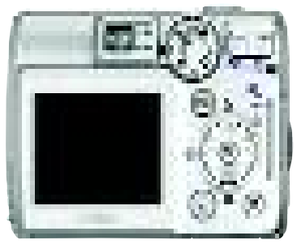
The upside of this is that the sensor chip is using the very centre of the lens image circle, what may be called the 'sweet spot' so that your files will be utilising the sharpest part of the lens optics.

Most digital sensors use only a portion of a standard 35mm lens' image circle as the lenses are designed for the larger 35mm frame size. Wide angle lenses therefore become effectively 'longer' when used on a digital camera. Full size chip cameras, such as the Canon 1Ds and 5D, take full advantage of wide angle lenses.

Most of you won't need to worry about the above because you'll be buying a camera with a fixed lens, one that cannot be removed and replaced by another. However, the principle still applies; look for a camera with a much wider lens than previously needed to get the equivalent wide angle with subsequent closer shooting distance and clearer images. The less water you shoot through, the clearer and more colourful your images will be.

Again you'll need to be cautious when selecting a fixed lens camera with a zoom lens. Is the lens optically changing in

Optical or digital zoom. Check the manual to see which zoom type the camera model uses before buying.



Rear view of Nikon 5600, which can be housed, with large LCD screen for composing and viewing images underwater.

A typical compact perspex housing for compact digital cameras. Great value, easy to use and a good beginners outfit.

Digital SLR cameras offer additional options and scope for advanced photographers but are more complex and pricey for beginners.

Modern digital cameras have highly complex image capture hardware. Take advantage of that by shooting simultaneously in both RAW mode for advanced post processing along with a jpg for quick image viewing, printing and emailing.

A typical cast metal housing. Some manufacturers may machine the housing out of a single block of marine grade aluminium. This Aquatica housing for the Canon 20D has an extension ring custom made for the 16-35mm zoom and an 8" dome with a shade.

focal length, or is it a 'digital' zoom? Some camera manufacturers claim their camera has a lens with a wide zoom range but all it's doing is taking the file and cropping it – not unlike making an enlarged photographic print then trimming it with scissors to give you a standard sized print. The effect may be the same as using a longer lens but the quality will be poorer as you'll be given a file with fewer pixels than one taken at the widest setting.

WHAT SORT OF HOUSING? You do get what you pay for. Perspex housings are cheap, lightweight, and allow you to see what's happening inside the housing. The downside is they're less sturdy under a rain of weightbelts than a metal housing. Is your perspex housing a snug fit for your camera? Too much space means a buoyant unit. Let it go and off it floats, never to be seen again. Does it allow you to access all of the controls that you use? Does it use an O-ring (circular in cross section) or a gasket (flat in cross section) for the main seal? A gasket will be less reliable as a water seal. Does it have the facility to use an external strobe? As your skills improve you may want to 'upgrade' to something more flexible than the built-in strobe.

SLR camera users will want a housing that has interchangeable ports to allow use of a wide range of lenses. While a 6 inch dome port is OK for general wide angle lens use, an 8 inch or larger dome will give better results and be more flexible. The manufacturers must also provide a range of spacers for the dome to suit various wide angle fixed focal length and zoom lenses. If you want to know why, a much deeper technical explanation can be found at **www.marinethemes.com/domespacer.html**. And, of course, a suitable macro port with spacers to use it with longer lenses is essential.

You may think that a cheap housing without these facilities is the way to go and it may be right now. But once you start to become more proficient you'll find that anything less than the above will stifle your abilities and your 'cheap' housing will prove to be a white elephant.

Check the fine print when it comes to weight and size of the housing. Some airlines are vicious with excess baggage so every gram counts, plus a smaller housing will mean less drag when underwater.

Jpg compression averages out colours, saving file size by describing surrounding pixels as one colour.

GETTING WHAT YOU SEE If the housing doesn't let you see the entire viewfinder it will drive you nuts. It may not be a problem if all you're doing is photographing nudibranchs where you have time to move your head around to see the edges of the frame but you'll go crazy when you keep cropping off the shark's nose or whale's tail. Do you have to let go of the housing and reach around to change aperture or shutter speed? You'll miss shots, waste dive time and imagine what that will do to those shy critters you've been stalking. A once strangely popular housing resembling a blue house brick forced users to let go of the housing and reach around to the front to change settings. I thought it was a hugely amusing practical joke except that it was made in a country not noted for their sense of humour. Recent models have fixed that problem.

Metal housings are more sturdy than perspex, usually have a snug fit with less internal air space and will not flex at depth. That said, perspex is usually cheaper and with care will last just as long and not suffer from corrosion as much as metal housings.

When shooting large subjects you are best served using either a full size chip camera or one of the 'built for digital' zooms that cater for the smaller sensor size. Tony Wu uses an 1Ds in a metal housing.

So there you are with your brand new digital camera in it's slick housing about to descend on that spectacular wreck or stalk the enigmatic paisley seahorse or do battle with a white shark. Your batteries are charged, card is inserted and you're ready to go.

IN THE RAW The last thing you need to decide is what format you're going to use. "Huh??!!" you may say, "***Format?***" When you press the button, your camera has to do something with those little electronic pulses emanating from the sensor and convert the data into something you can use. Every digital camera on the planet records the information supplied by the sensor in a form called a RAW format. You have no control over it, cannot use it and, unless you have absolutely no social life, have no need to understand it. What you do need to do is to decide what your camera does with it. Every camera manufacturer has a different RAW format. Surprise, surprise! In fact, often different models made by the same manufacturer may have different RAW formats. Nikon has one that will produce a RAW file with a '.NEF' extension to the file name, Canon with a '.CRW' extension, Olympus with a '.ORF', etc. (i.e. a file may be called 'xyz123.NEF') Manufacturers often have other file extensions as well. What's needed is for your camera to turn it into something you can use.

The most popular format is called 'JPEG' and files converted from RAW will have a '.jpg' extension. (i.e. 'xyz123.jpg') The second most popular file type is a 'TIFF' file (i.e. 'xyz123.tif') The difference is not just the name but the way the file is saved and recorded.

Put simply, when a file is saved in JPEG format, a group of pixels have their colour values averaged out into one colour. So, a clump of 4 pixels may all be blue but each is slightly different. When the file is saved, those 4 pixels can now be represented by one number representing one colour of blue. That means that the file will be approximately 1/4 the size of the same file saved with four different colour values. The file is now 'compressed' or smaller in megabytes than the original, but has less colour information. While that isn't a problem when the compression is at a low level, such as our example of averaging four pixels, it does become a problem when the file is set to average out 8 or 16 or 32 pixels or more and also where the file is allowed only so many different colours of blue.

When a file is saved as a highly compressed JPEG file it contains much fewer colour values resulting in rougher transitions between colours and, in extreme cases, a jagged appearance as the blocks of colour become

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obvious at lesser magnifications. JPEG format can therefore be referred to having a 'lossy' form of compression – losing colour and definition. The upside of JPEG compression is the files are much smaller in megabytes, so more images can be stored on a camera card or computer hard drive and transfer much faster over the internet.

Tiff files save each pixel's colour values. While TIFF files can be compressed, the size of the compressed file is not as dramatically different from the uncompressed file, thus taking up more space on your card and/or computer and taking much longer to transmit over the internet. However very few cameras allow you to save your images as tiff files, you have to use your computer to do that.

Most cameras, but not all, provide the best option; save all your images as RAW files plus create jpgs for you at the same time. You may be able to dictate what level of compression is applied to the jpg as well as the physical dimensions of the image.

The advantage of a RAW file is that you can adjust exposure, colour balance, contrast and saturation to a much greater degree than a jpg file. Its like having a negative or slide to work with as opposed to a colour print. You have all the original information with a huge range of possible adjustments, while a jpg has already assumed most of those for you then dumped a lot of colour information in the process. In most cases the jpg may be just fine but, when it really counts, if you don't have a RAW file you'll have lost the ability to get the best out of your shots.

The downside of RAW files is that you need a computer to turn them into something you can use (a jpg or preferably a tiff file) which takes time and a certain level of skill. They also take up a lot of room on your camera's card. However, if you have any sort of aspiration to do something more than just email or print out your shots as 6 x 4 prints, you should have your shots in RAW format as well.

"But if I just save jpgs I can fit hundreds of shots on my camera's card! And if I choose a small file size and high compression rate I can shoot for weeks without having to empty my card!"

The basic laws of this universe state that you get nothing for nothing. It isn't a positive thing to have hundreds or even thousands of shots on a card. If the card becomes corrupt, and it does/will happen (usually right at the end of that expensive overseas trip) then you lose everything. Also the jpg files will not give you the quality that you may want for some of your files. Compared to buying a roll of film and then processing it, the price of a larger reusable card is a bargain. There are now 1-8 gigabyte cards that will hold hundreds of shots saved as both RAW and jpg files. Lash out and buy a few.

So far we've only discussed fairly dry technical issues. The next article will deal with using your camera to compose, design and capture the images you want. That is where the real fun starts.