Graham's Photoblog Newsletter

For Week Ending 7th August 2021

Thank You

Thank you to everyone who sent good wishes following last month's newsletter.
I was overwhelmed by the response and outpouring of support – a truly humbling experience. I'm feeling a little brighter now even though I have not had a conclusive outcome to all my hospital tests etc. They did reveal some issues which I will have to learn to mange but at least I have a roadmap as to where I out to be heading.

Some Useful Data

Quite often it is useful to be able to understand the meaning behind some of the expressions that we frequently use such as "hyperfocal distance", "equivalent focal length", "magnification ratio" etc. so I thought I would tabularise them here for reference.

Standard Paper Sizes

Inches	Cms		Inches	Cms
3 ½ x 5 ½	8.9 x 14		8 x 10	20.3 x 25.4
5 x 7	12.7 x 17.8		10 x 10	25.4 x 25.4
6 ½ x 8 ½	16.5 x 21.6		16 x 20	40.6 x 50.8
7 x 9 ½	17.8 x 24		20 x 24	50.8 x 61

Neutral Density Filters

ND Filters (neutral density filters) have no effect on colour but simply cut down on the amount of light entering the lens allowing you to use a larger aperture, longer exposures or simply take images of objects that would be otherwise too bright (such as the sun).

In the following table I have listed the common values available, however they can be combined in value to achieve larger attenuation.

Filter (ND Value)	Filter Factor	Exposure Increase in F-stops
0.1	1 ¼	1/3
0.2	1 ½	2/3
0.3	2	1
0.4	2 ½	1 1/3
0.5	3	1 2/3
0.6	4	2
0.7	5	2 1/3
0.8	6	2 2/3
0.9	8	3
1.0	10	3 1/3
2.0	100	6 2/3
3.0	1000	10
4.0	10,000	13 1/3

Values in purple are the common values used.

Lens Field of View

Here is a table of the Field of View (angle of view) of common lenses on 35mm Full Frame Cameras

Use the Equivalent Focal Lengths for cropped sensor cameras.

Lens Focal Length	FOV (degrees)	Lens Focal Length	FOV (degrees)
18	100	100	24
25	80	135	18
28	74	210	12
35	62	300	8.5
50	46	400	6

On a 35mm full frame camera 50mm focal length is considered “normal” as this equates to the same relative image size when the image is viewed on the LCD or EVF compared to what our eyes see.

For APS-C, 27mm is considered as normal. On Micro four thirds 25mm, on type 1inch 18mm and for 1-2/3 inch sensor camera 9mm would be considered normal (these of course are the native focal lengths not the Effective Focal Lengths).

Crop Factors

Crop factor figures are useful in calculating 35 mm equivalent focal length and 35 mm equivalent magnification. Some common crop factors are:

Sensor Size	Crop Factor	Sensor Size	Crop Factor
1-2/3	5.6	Canon APS-C	1.6
1-1.8	4.8	Other APS-C	1.5
Type 1 inch	2.7	Full Frame	1.0
Micro Four Thirds	2		

For equivalent Focal Length multiply the camera lens native focal length by the crop factor.
For example the FZ1000 has a native lens focal length of 9.1 to 146 mm

When we apply the 2.7x crop factor the effective focal length becomes 24.57 to 394mm which Panasonic round as 25-400mm.

The other things to consider when comparing crop factor is the effect on depth of field and on ISO performance.

The equivalent depth of field is also calculated as the depth of field at the full frame aperture multiplied again by the crop factor.

As an example when we shoot at F4 on the FZ1000 although the light gathered is the same as F4 on any other lens the depth of field recorded by the sensor is the same as that which would be recorded on a full frame camera at 2.7 stops smaller. In other words the image would have the same depth of field as about F10 on a full frame camera at the same focal length and same subject to camera distance. The same F4 on the FZ300/330 would have the same depth of field as F22 on a full frame camera again at the same focal length and same subject to camera distance.

When we look at ISO performance if we consider the image noise from two sensors, then if they are of the same generation and type (we are not comparing CMOS to CCD or CMOS to BSI CMOS for example) then the small sensor would exhibit noise equivalent to the ISO multiplied by the crop factor squared.

Again as an example ISO 125 on the FZ1000 exhibits the same noise as ISO 1000 on a full frame camera and an image captured at ISO 100 on the FZ300/330 would have the same noise as an image captured with ISO 3200 on a full frame camera!

I hope that answers many of the questions like “why can I not set F16 on my bridge camera” or “why is ISO 100 still quite noisy!”

Understanding Hyperfocal Distance

Of all the technical qualities of a prized image the most sought after is probably image sharpness.
In a good image the parts of the image that the photographer wants to be in focus are perfectly sharp with the rest of the image blurred. Yet there is only one means of controlling what can be made sharp and what cannot and this is by exploiting "Depth of Field."
When capturing an image you normally focus on one point only, yet because the lens has depth of field points in front of this and those behind it are also acceptably sharp.
When photographing landscapes one common fault made by inexperienced photographers is to focus on the distance scene – often at infinity.
Whilst this does give very good sharpness in this area the photographer has missed out in capturing more of the foreground in sharper detail.
The Maximum depth of field in any image is achieved when the camera is focused at what is called the "Hyperfocal Distance".
This is a point nearer to the camera than infinity so that the depth of field extends just to infinity but includes points much nearer to the camera than if the camera was focused at infinity.
When the camera is focused at this hyperfocal distance the depth of field is extended so that every part of the subject from half the hyperfocal distance to infinity is rendered acceptably sharp in the image.
If you were to use a wide angle lens, setting the focus distance equal to the hyperfocal distance often means that for snapshot pictures there is no need to focus at all and can lead to some better street photographs as you can concentrate on capturing fleeting expressions or candid poses etc. Some single use film cameras had lenses set at this hyperfocal distance so the user didn't have to worry about setting focus etc.

There are a couple of things that you should be ware of which affect the hyperfocal distance and acceptable image sharpness.
When light rays are focused from a point on the subject the resulting image is actually a "disc" and not a point.
These discs are extremely small and are called "circles of confusion"
So if the focus point of the image is in front of the sensor plane (from a point farther than the focus distance) or behind the sensor plane from a point in front of the focus point) then this disc image recorded by the sensor will be slightly larger.
An overall image made up of a large number of larger discs looks unsharp. The larger the discs the more unsharp the image looks.
To put this into some perspective, the size of the discs up to 0.25mm in diameter are indistinguishable from actual points which are perfectly sharp.
Image (on screen or in print form) sharpness is also affected by viewing distances with larger images being viewed at greater distances – think about advertising billboards.

To calculate the hyperfocal distance it can be done using simple formulas.
This involves knowing the focal length of the lens, the aperture used and the size of the permissible circle of confusion.
There are many tables and smartphone apps to make this simpler.

As an example a 50mm (actual focal length) lens set at an aperture of F2 has a hyperfocal distance of 37.5 metres. If the F-stop is doubled to F4 then the hyperfocal distance becomes halved to 18.75 metres. Set the aperture to F8 and the distance becomes halved again to 9.375 metres.

So with the lens aperture set to F8 the hyperfocal distance is 9.375 metres and if the lens were to be focused at this distance the actual depth of acceptable sharpness would extend from half this distance to infinity – 4.68 metres to infinity.

Some lenses actually have hyperfocal scales engraved upon them and if you set the infinity mark to the aperture number that you are using you can see the closest focus point opposite the same aperture number on the lens.

For lenses and cameras that do not show the actual focus distance there is a simple rule of thumb that can be employed to set the maximum amount of depth of field in an image.
It is important to note that, if you focus at the hyperfocal distance, your photo will be sharp from half that point out to infinity. So, if your hyperfocal distance for a given aperture and focal length is ten feet, everything from five feet all the way until the horizon will appear sharp.
Your focal length also has a huge impact on hyperfocal distance. As you zoom in, your hyperfocal distance moves farther and farther away. For a 20mm lens, you may need to focus just a few feet from your lens to get the horizon (distant background at infinity) acceptably sharp. On the other hand, for a 200mm lens, your hyperfocal distance may be hundreds of feet away.

There is another technique that is also commonly taught and that is the double distance focus method.
The double the distance method is a way to maximise a photo's depth of field by focusing at the proper distance in a scene. Your goal, using this technique, is to equalize the photo's foreground and background sharpness.
It is a relatively easy technique to apply in the field. To start, look at the closest object in your photo and estimate how far away it is from the camera Then, focus at a point which is twice that distance.
So, if the nearest object in your photo is a patch of grass at the bottom of your frame, ask yourself how far away it is. If the grass is one metre away, all you need to do is focus on an object that is two metres away.
You can estimate these distances; they don't have to be perfect. If it's easier, just visually double the distance. You can even walk into the scene and count paces for the same result.
After you've made the foreground and background equally sharp, it is a bit trickier to make sure they are optimally sharp.
To get there, you need to use the perfect aperture, balancing out aberrations (i.e. a blurry lens), depth of field, and diffraction.
However, if you don't want to figure this out with depth of field charts (which are usually inaccurate because they use a too large circle of confusion diameter for modern high resolution sensors) here's a good rule of thumb:
For full frame cameras F8 is good for landscapes with infinity focus whilst F11 is better for wider angle lenses with more foreground in the image and F16 when using longer focal length lenses.
Of course if you are not using a full frame camera system use the equivalent aperture for your system (so F4 on most bridge cameras will give the best imaging conditions).

Photography in the rain

After what seems like weeks of hot dry weather here in the north of England that has suddenly come to an abrupt end with heavy rain storms. These wet and heavily overcast days are ideal for photographing flowers as they add elements that are often difficult to replicate such as the formation of raindrops on petals and leaves.
Provided that you keep the camera body and lens shielded from light rain it is possible to get outside to take advantage of this situation.
In these two images, captured at 1/240 sec, F5.6 and ISO 400 with the Fuji XT-4 and the 18-55mm standard kit lens I was able to get some lovely shots of the raindrops (and rain streaks) during a period when the heavy downpours subsided into just a light drizzle.

Greens take on a lovely vibrancy in this light.

Modified Desview T3 Teleprompter Mounting

When I reviewed the Desview T3 teleprompter I was very concerned about the weight of this unt that would be place on the lens – especially if you fitted a large tablet as the projection source.

So I designed a small rig which would support the whole assembly and not impose any weight on the lens at all.

If you are interested the design idea is featured on my reviews page of my photoblog,
https://www.grahamhoughton.com/reviews-2/

The video of the modification is here on Youtube

FeiyuTech Pocket 2 Stabilised Camera

The Pocket 2 is the latest release of Gimbal Stabilised Camera by FeiyuTech.

I was lucky to be sent this camera for review about 2 months ago and have been extensively testing it out in as many situations that I could. It has undergone several changes from the original Pocket model. Some of the major changes have been in the changing of the camera sensor from 8M to 12M pixels (still a 1-2/3 inch Sony CMOS sensor) and changing the lens to a 130 degree FOV and an aperture (fixed) of F2.0.

The hand grip has changed and now incorporated a multifunction joystick controller and a record button. There will also be an audio adaptor that will allow an external mic to be used with the camera. The camera can also be connected and controlled from a smartphone app (Feiyu Cam).

There are now quite a few of these gimbal cameras in the market place with DJI possibly holding the crown (but at a price).

I was expecting quite a lot from the gimbal/camera as the initial specifications looked very promising with the camera able to shoot 4K 60p with 100Mbps bit rate.

The touch screen is very small and requires you to remember the “swipes” needed for each of the menu functions. It took a while to memorise the actions needed to perform some functions. Being small it was often difficult to hit the exact on screen icon to facilitate a change.

The lens is infinity focused so it is not possible to do autofocus at close range – anything from about 50cms to infinity is acceptably sharp. The specifications called the lens a 16mm equivalent focal length with a 130 degree field of view with an aperture of F2.0. During all my tests the EXIF file only ever reported F2.8 (as the original Pocket) but this may just have been a typing error in the camera firmware.

130 degrees was chosen I guess to allow a much wider view and allow selfies without having to extend the camera way out at arm’s length. I found this was too wide for most of the shots that I wanted to take. The Super Wide mode has the native 130 degree FOV with Wide and Narrow being crops from the original sensor output. When you look at one of the RAW (DNG) files you can see the almost Fish Eye look of the lens so the processor is working very hard to apply some linearisation of the footage to allow a near normal view to take place.

When I looked at the first video clips that I has shot in all 3 modes (Super wide, wide and narrow) at 4K 25p I was totally disappointed in the quality of the resulting video. In the uncropped super wide mode the edges/corners of the image were very distorted/out of focus. The result was a little better in the two cropped modes but not brilliant.

In the above screen capture from 4K 25p in the wide mode the edges are still unacceptably sharp for me.

It would appear that at the higher frame rates the image quality also suffers some hits – maybe the bit rate is too much for onboard processing and some line skipping has to take place? Try moving the camera and you see that the image processing cannot cope with the massive change in pixel data change and the resolution drops dramatically. In my test shots I could not get clear images when the camera was moving (such as walking slowly down a line of flowers in the sample video on YouTube)

Using the 1080p slow motion mode generates video which is just unacceptable with resolution looking like VGA video era clips!

If you only view this on smartphones or tablets you probably will not see any problems but viewing this on larger screens, especially 4K capable devices, you will see just how poor the images really are.

In 4K 25P narrow mode again the whole image is very unsharp and the bit rate has limited the resolution achieved so the out of focus areas look even worse.

With the fact that the camera is infinity focus and you cannot get close up shots (which you can with the DJI Pocket 2) it severely limits the opportunity for me to use the camera – even if I crop out the centre to lose the distortion. There is no aftermarket ND filters for the original pocket version so again if you want to reduce the shutter speed in bright sunlight to capture more realistic video with the usual 180 degree shutter angle motion blur then you cannot.

The microphone placement is also just awful, Your natural handing of the camera means that your palm will cover the mic port.

You have to modify your grip to allow the port to be open to receive unobstructed audio. The gain of the mic, even when boosted to maximum in the camera, is still about -30dB too low. I guess the reason is that even in a quiet environment the mic picks up the gimbal motor noise if you are moving the camera. The need for an external mic accessory adaptor may help but why not include the 3.5mm port (like on the FIMI camera) in the first place instead of another device to carry and plug in!

So what are my conclusions. It's a camera that I really wanted to like but it fell way short of my expectations and it offers nothing over what is already on the market and that is being done far better by the other manufacturers. The screen is too small for accurate assessment of exposure and it us really necessary to use the smartphone app to view the video. Having said that you then have to contend with a very high latency of the video versus real world view.

I didn't include any night time low light shots as they were just unusable and stills shot with ISO 400 and above were reminiscent of cameras from pre 2000.

It is going to be a high price item (£350) but I think that it would be worth considering the DJI Pocket 2 which appears to have better resolution from a larger sensor, better colour science and a lens with autofocus. The FIMI is also another alternative that is probably worth investigating.

I have watched other reviews of the camera now on YouTube and I have to ask the question did I get a very bad product or have the video clips you see on some of these been cropped to exclude the distorted/out of focus edges?

I was fortunate that FeiyuTech asked me to review the product. Had I bought this through Amazon it would have been on its way back now!

Samsung S21 Ultra

I have recently testing my new smartphone- the Samsung S21 ultra as a replacement to my aging Huawei P20 Pro. So far I have been quite impressed by the quality of the images and video clips that I have taken. Granted the images do have the "smartphone " look with too much sharpening for my taste.

So far I haven't tested it out in the RAW file mode if it is available?) to see what can be pulled from the image but I guess for most users the default JPEG camera results are very good. The camera 4 lens combination (3 rear and one front) gives a better scope for capturing an excellent range of photographic genres.

Particularly the x10 optical zoom achieved excellent results in my tests. The x100 digital zoom is probably more of a gimmick than useful though. The camera is capable of 100m pixel in a 4 x 3 aspect ratio - if you enable it- I have attached a couple of images.

A section of a 108M image (left) versus a 12M image (right). The 108M image looks less granular – especially in the grass areas.

Figure 1 the whole width image (12M) lens

Figure 2 The S21 rear lens block

Figure 3 Cropped image from x1 lens

Figure 4 Image from x10 lens

On a very overcast day I captured the comparison shots of x1 lens and then x3 and then x10 where all these are native focal lengths from the 4 rear lenses.

At this point I had not tried out the full 108 megapixel mode but I think that it may have resulted in a much more detailed image and allowed some cropping to be made. It is only available on the x1 lens and has a fixed 4:3 aspect ratio so you have to allow for this if you want the images for adding into video productions.

The lenses are: 108-megapixel (wide-angle), 12-megapixel (ultrawide), 10-megapixel (3x telephoto) and the 10-megapixel (10x telephoto).

From the 108M sensor the camera uses a 3x3 pixel binning method to reduce the image size and this has the advantage that the signal from the 9 pixels is combined giving better low light performance (apparently).

Captured with x1 lens

Captured with x3 lens

Captured with x10 lens (note a little purple fringe and sharpening halo)

X1 image (12M) and enlarged crop from the centre

Crop from x1 lens (Lythym Hall, Lancashire)

Crop from x10 lens

This is the “Big One” at Blackpool Pleasure beach and shows the car train as it begins its 62 metre (205 foot) plunge reaching 3.5G

Overall I’m very happy with the images being produced. I haven’t shot any video yet but it is capable of 8K Video capture and still extraction. I’ll be doing low light/night time shots soon and comparing the current low light king the iPhone 12 pro.

Safely Using External Power Supplies With Your Camera

Sometimes it is necessary to power your camera from an external power supply for long video shoots, time lapse or other long exposure modes.

The options are using a mains power adaptor if you are shooting indoors or have access to a wall outlet in the garden for example. Out on location then the options are to use larger capacity lithium ion packs such as those used for cycle batteries, headlamp torches etc., which are often between 4000 and 8000mAH and will give 3 – 6 times the normal run time of the internal battery.

You can use high capacity USB power banks with a dc-dc step up converter to generate the 8.4v or use a USB type C PD power bank with a ZY12 trigger to directly output 9V and then drop this to 8.4 with a series silicon diode.

You can use high capacity, higher voltage power tool batteries and then use a step down (buck) convertor to achieve the 8.4 volts,

All of the se of course require you to use a “dummy” battery box to replace the internal battery. Now this is where some of the problems will arise if you want to go down this route. Panasonic, in particular, are “fussy” about the voltage of the external dc power supply and with a lot of the dummy battery boxes you will still see “this battery cannot be used” type of message if the voltage is under 7.9v that most cameras seems to need. With a fully charged lithium ion battery you will normally see something in the order of 8.3 to 8.4 volts and these will work however you will only have the range of this voltage down to 7.9v so will only have limited capacity. The normal cells will drop to 6.4 volts for the 100% capacity. You will need the modified battery box which adds a 10K resistor between the -ve and “T” terminal to instruct the camera to see the external power supply correctly.

In my latest YouTube video I look at all the methods that you can use and why using the 8.4V lithium pack is the safest way to externally power your camera and why power banks and power tool batteries are the least safest.

Link to this video

So until the next newsletter, early September, thanks for reading and take care.

Graham