

Focusing Techniques, Tips and Pitfalls – Bob Young

I bought a new Nikon D800. Normally after eagerly opening the box, charging up the battery, fitting a lens and taking a few test shots we expect to be amazed at the brilliance of the image and our new camera. Sadly that was not the case. When viewed at 100%, not one image was correctly focused.

Perhaps I should have at least opened the manual, so better late than never. I seemed to have done everything OK, so time to look more closely at the images and take a few more test shots. Careful examination revealed that all images were 'back focused', that is the area in focus was further back in the image than the focus point. The background was more sharply focused than the subject.

A call to the supplier, a visit to the camera-doctor, and all was corrected promptly and under warranty.

However the next set of test images was still disappointing. I resorted to the internet in search of answers. In summary, the consensus of opinion on reputable forums was that

"I suspect that dynamic focussing underwent subtle tweaking in its behaviour in the D800 – slightly different from how it behaved in the D700, and something that I will need to investigate further. The D800 appears to employ the neighbouring focus points much more enthusiastically than the D700, thereby shifting focus slightly without the user noticing. This may be fine and desirable when shooting a moving subject, but may cause slightly soft images when shooting a stationary subject."

(Jacques,
apple-and-eve.com)

Nikon's autofocus system was:

excellent – some of the time;

below average – some of the time;

inconsistent, bordering on rubbish – some of the time.

Now in fairness to Nikon, the most frequent cause of the problem is the user – not so much the equipment, but rather how we use it. Nikon has made changes to how the autofocus system works over recent releases of new models, as has Canon. If you were coming to the D800 from the D3, D700 or D4 for example, the learning curve is far less than if your previous camera was a D2 or earlier. Some things just don't work the same and some things are not clearly explained.

One of the first things to come to grips with is the selection of the focus point. The D800 provides 51 focus points for you to choose from. But, depending on the focus mode, the camera may arbitrarily move to another focus point and you will probably not necessarily be aware that it is no longer focusing on the point that you chose. There seems to be two reasons why this happens:

1. In continuous servo mode you fail to keep the focus point on the subject. e.g. you are focused on the bird's

“Regarding using high ISO for bird photos. With my 7D up to 1600 ISO is OK, with the D800 up to 3200 ISO is OK.

I normally use aperture priority at f8, 800 ISO and centre point auto focus. That is my standard. I only lower ISO in very bright conditions, e.g. waders along a beach.

I agree with you that camera movement is by far the greatest reason for soft images. Therefore a handheld shot with a long lens (400mm +) of a perched bird still needs 1/2000sec for a sharp result, no matter how good the camera operator is at slower shutter speeds.

I use a monopod wherever possible, or support of a tree, post or sitting on the ground with elbows on knees, etc.

Image stabilisation, vibration reduction, whatever it's called on whichever brand, helps; but, I can still blur that image“

Peter Gower, South Australia.

head while tracking the bird in flight and you ‘lose’ the bird from the focus point, which is now positioned on the sky. The camera will attempt to refocus on the subject and continue tracking – but the focus may not now be on the bird’s head, it is likely to be the closest object (or part of the object) with good contrast at a focus site nearby to the original focus point. That seems an admirable solution, if only you knew what had happened. There is no visual clue to alert you to the fact the focus point has changed.

2. There are 3 built-in selection patterns (focus area modes) – 9 points, 21 points and 51 points. The manual states: “In AF-C focus mode, the camera will focus based on information from surrounding focus points if the subject briefly leaves the selected point. The number of focus points varies with the mode selected.” However, many authoritative reviewers claim that this is not as it appears – they believe that whilst you may only have 9 focus points to choose from in the 9 point focus area mode, for example, the autofocus system will still use all 51 points and may move focus to a surrounding point whether or not it is displayed in the 9 point group.

Talking with a couple of Canon users (John Stirling and Ian Wilson) it seems as though this ‘artificial intelligence’ is also a feature of the modern Canon DSLRs as well. For Canon users it would appear that the good news is that their ‘artificial intelligence’ is either more intelligent or better behaved and produced more consistency than the Nikon counterpart.



Image 1 © Peter Gower 2014

It seems to be universally accepted that in both Canon and Nikon systems the Live View autofocus is more reliable and more accurate than 'phase detection' autofocus system which relies on the mirror being in the down position. The downside is that it is also noticeably slower and that the viewfinder cannot be used while in Live View mode. This presents a further problem as I and, it would appear, many others find it very difficult if not impossible to see the LCD on a bright sunny day when photographing outdoors.

There are a number of LCD shields / loupes on the market. Rob Parker, Ian Wilson and myself had the opportunity to test the Varavon loupe. Initial tests were promising, although it was very difficult to use the buttons on the back of the camera as they were partly concealed by the body of the loupe. The image was clear and, combined with the 'zoom' function for the LCD on the D800, it was possible to view the image at close to 100% view. We were able to manually focus very accurately. However the 'show-stopper' was the manner in which the LiveView functioned. After a shot or burst of shots was taken, the LCD screen would blackout until all images were written to the memory card. This could be 3 – 5 seconds with a single shot and a burst of 10 shots took 15 seconds to write out. During this time the camera was not able to be used. This is not a choice I would recommend for bird photography.

Autofocus systems have always had difficulty in accurately focusing in low contrast situations, where other objects are in front of the subject, e.g. twigs, where there are closely repeating geometric patterns, etc. By and large the latest releases have not resolved these issues. In many of these cases manual focus is the only option. The size of the image in the view finder has always made manual focus in DSLRs, and their 35mm predecessors, more difficult compared to the medium and large format cameras. In Live View we were able to zoom in and view the image at virtually 100%, which is a great advantage when using manual focus. Unfortunately no such option exists when manually focusing through the viewfinder.

As Ian Wilson discusses in his article in this newsletter, these 'minor' focusing problems, vibrations and lens diffraction have always been with us, but the increased image size of the full frame sensor exaggerate the effect to the extent that what was not visible or was only barely visible in the APS cropped sensor is now clearly evident with the full frame sensors.

Since many (probably read most) of the focus problems are related to the way in which we use the autofocus system or the environment in which we use it, how can we reduce the chances of losing images through poor focus?

1. Camera movement is probably the most frequent cause of blurring, not poor focus. The solution is simple – accept that you, along with the majority of the human population, do not have the same core stability as you did when you were an 18 year old. Even with image stabilisation (IS) or vibration reduction (VR) systems the expectation that the average 60-year-old photographer can take a hand-held image with a 600mm lens with pin sharp focus

at shutter speeds of less than $1/100^{\text{th}}$ of a second is unrealistic. Using some form of stabilisation which is appropriate to your age/ physical ability, focal length of the lens, etc. is essential. This may be a tripod, monopod, a bean bag which can be placed on a post or rock to support the camera and lens, or even simply bracing your body against a tree or wall to assist.

2. Subject movement probably comes a close second to camera motion. Even a bird which appears to be perfectly still may result in a blurry image if wind is ruffling the feathers. However it is not just wind which we have to consider. Birds are in flight, feeding or just plain moving around. Attention to shutter speed is essential, but this is often a balancing act between shutter speed and aperture required for the appropriate depth of field. ISO is frequently over looked as an equal component of the exposure triangle. In good lighting conditions, you should expect to be able to use ISO of 1600 or 3200 without noise becoming a serious impediment. Before trying to resolve autofocus problems one should always make sure the cause of the 'blurries' is not camera or subject motion. A simple method for this is to mount the camera on the solidest tripod you have available and focus on a fixed subject that will not be affected by wind or the like. Now take a number of images using autofocus, manual focus and - if available - Live View autofocus and Live View manual focus. In a perfect world these should all be the same, but it could be expected that Live View will produce better results as mirror-up vibration is eliminated. If the traditional 'phase detection' autofocus demonstrates poorer focus than manual focus or Live View, you can try the Autofocus fine tune feature (if available in your camera) or you probably need to book your camera in for service and adjustment.

Options to Improve Sharpness

Camera manufacturers provide us with a number of options to customise the way in which we use our equipment.



Image 2 © Bob Young 2014
100% crop of 2% of original image. No sharpening applied.
Nikon D800, 80–200mm f2.8 zoom, 1/200 @ f13, ISO 400

Unfortunately the manual generally only explains how to make these changes and does not adequately explain how or why the option may benefit you and what effect the change you make may have on other functions. The internet can help in providing the missing information if one is prepared to confirm the credentials of the writer. Here are some of the things I have found.

1. All lenses will have a 'sweet spot' – the aperture at which it will

“How do I get sharp photos?

By getting several important things all right together – any one wrong and there’s some softness; I’m often frustrated because many of my images are not as ‘pin-sharp’ as I would like.

Hand-holding a large lens seems to be beyond me these days – although that’s really the only option for birds in flight. I recently got a monopod, and find that it has improved my images considerably.

My Canon 350D is rather long-in-the-tooth (can’t wait ‘til the 7D MkII hits the streets), and poorly performed as far as ISO setting is concerned. I aim for a shutter speed of *at least* 1/focal length, preferably higher; slower and the image is usually soft, if not unacceptable. I often find that at the widest aperture – and therefore least depth-of-field so most criticality of focus – I need an ISO of 800 or more to get an acceptable shutter speed; and images are getting noisy at 800 ISO in this camera.

I shoot in Aperture-priority mode, with a single-point autofocus, controlled by the * button on the back of my camera. Images are stored as raw files, and the final step of my post-processing is *always* sharpening, usually with Unsharp Mask.”

Rob Parker.

produce the sharpest image. This may be different with different cameras and is often most noticeable when using cameras with different sensor formats (APS vs full-frame for example).

A simple way to find this ‘sweet spot’ is to download a lens resolution test chart from the internet and photograph it at different aperture settings, keeping ISO and subject distance the same. A visual inspection will allow you to determine the aperture at which focus is sharpest.

While you have everything set up, take another set of images with the aperture set to the value which previously gave the sharpest image, but this time vary the ISO from smallest value to largest. A visual inspection will give you an indication of the impact of noise at higher ISO values.

If you are using older lens with modern full-frame DSLRs, it is important to remember that although they were designed for the same film/sensor size, they were not necessarily designed for the ISO and shutter speeds of today’s cameras. Cameras of 30 years ago typically had a maximum shutter speed of 1/500th second, occasionally 1/1000th, and colour slide film was 50 – 160 ASA (ISO) with some ‘high speed’ film up to 400 ASA; a long way short of today’s 1/8000th second shutter speed and ISO of 25600 and above.

2. Whenever practical use Autofocus – single servo mode and single focus area mode. I would use this in all situations when the subject is static or very little movement is expected. Used in conjunction with the AF-ON only option which I will discuss shortly, this virtually removes any chance of the camera’s artificial intelligence changing my focus site selection.

3. In addition to the options in 2 above, set the release mode to mirror-up or set the exposure delay mode to On and the delay to 2 seconds (menu item d4 on the D800). This delays the opening of the shutter for 2 seconds after the mirror is raised, allowing time for any mechanical vibration to be dissipated. In both cases the camera should be on a tripod, and a remote release cable is recommended if using the mirror-up release mode. Theoretically, you could use the self timer if mirror-up or exposure delay is not available on your camera. This may not be an option which you would prefer for bird photography though.

"I have been meaning to write to you about the statement in your newsletter article that the 'recommended minimum shutter speed for hand-held shots of $1/(\text{focal length})$... is no longer recommended for DSLRs with a full frame sensor'. I have not seen this stated anywhere else but I can see where you are coming from. I think it is probably a reasonable recommendation for high megapixel cameras with long lenses or other kinds of cameras with small pixels and long lenses. However, for full-frame cameras with say 12–22 megapixels, and with IS or VR on, I feel comfortable with the old $1/(\text{focal length})$ rule of thumb. This is certainly my experience with my 5DIII and lenses from 300–600 mm focal length. With the D800 I can easily imagine that a more rigorous rule of thumb might be required, even with VR on. I therefore wonder if you should qualify your new rule of thumb and suggest it be used for high megapixel cameras like the D800 or cropped sensor cameras with small pixels like the new range of APS-C 24 megapixel cameras from Nikon, Sony and others." – Ian Wilson.

The recommendation was contained in a Nikon Forum advisory relating to the D800 – Bob Young

4. If practical, use Live View. Unless a loupe is suitable to your requirements, this option may not be practical in the field. In a studio situation, tethering your camera to your laptop in conjunction with Live View can produce excellent results using autofocus, manual focus and focus stacking.

5. The recommended minimum shutter speed for hand held shots of $1/\text{focal length}$ (e.g. $1/100$ sec for 100mm lens) is no longer recommended for DSLRs with a full frame sensor. The recommendation is now $1/(\text{focal length} * 3)$ or $1/300$ sec for a 100mm lens.

6. Use the lowest possible ISO value. It is not uncommon for photographers to set their ISO to say 800 and then forget it. In all probability your image will be sharpest when the ISO is set to the smallest value, so unless there is a reason for a higher ISO you may be sacrificing sharpness unnecessarily. The original decision of the value at which to set the ISO is often related to being able to have a shutter speed of, say, $1/2000^{\text{th}}$ second for photographing birds in flight, for this an ISO setting of 800 may be completely reasonable. But in terms of achieving maximum sharpness, it does not make sense to continue with a shutter speed of $1/2000^{\text{th}}$ second or ISO of 800 if the subject is perched on a post. If you are concerned about handheld 'blurries', I would recommend using some form of stabilisation which will allow the

shutter speed and/or ISO to be reduced.

AF-ON only technique

In point 2 above, I made mention of AF-ON only. AF-ON only is a menu option (a4 on the D800) which decouples the autofocus function from the shutter release button. Instead of initiating the autofocus function by partially depressing the shutter release button, custom settings are set so that autofocus can only be initiated by pressing the AF-ON button on the back of the camera. The advantage is that the camera will not refocus when the shutter release is pressed; you can continue to shoot as if you were using manual focus, in a sense, as the focus will not change until you press the AF-ON button again.

By itself, this does not achieve very much. But what we are going to discuss entails using the AF-ON decoupling to link together the functions of the servo control, the shutter release mode and focus lock into a single one-button activation which, once set, may rarely need to be reset. In fact the only additional action required to ensure correct focus is to use the multi-selector button immediately below the AF-ON button to select the focus point.

Before we can use this technique there are a few decisions to be made and settings adjusted.

1. **AF activation:** The custom settings menu item a4 - AF activation offers two options:
Shutter / AF-On or
AF-ON only.

Since we want to decouple the ability to use either the shutter release button or the AF-On button, we must select “AF-ON only”.

2. **AF-S or AF-C servo mode:** To gain the greatest flexibility of this technique, I recommend that AF-C servo mode is selected. We can then ‘press and release’ the AF-ON button to focus and hold the focus – it will not change until the button is pressed again. You can therefore focus on your subject by pressing the AF-ON button, release the button and recompose your image.

This could also be obtained by using the AF-S servo mode, but if you wish to track a moving subject AF-C servo mode is recommended. In this mode we can use ‘press and release’ or continue to hold down the AF-On button to continuous focus as we track the subject, just as we would have by continuing to partially hold down the shutter release button.

3. **In the Autofocus custom settings** - menu item a1- we need to set the AF-C priority. This determines focus status necessary to allow the shutter to be released. There are 3 options:

Release Priority – this will allow the shutter to be opened whether the camera thinks the subject is in focus or not.

Release + Focus Priority– this will allow the shutter to be opened even if correct focus is not achieved, but it will first attempt to obtain focus on a nearby focus point in the same grouping. This increases the delay between pressing the shutter release button and the shutter actually opening

Focus Priority – the shutter will open only if the focus has been achieved and the “focus dot” in the viewfinder is illuminated.

Selecting Release Priority will give the greatest flexibility as it allows the option to focus and then recompose.

4. **Shutter release mode:** The options are single shot (S), continuous low (CL), or continuous high (CH). Quiet, self timer and mirror-up modes could be used for specific purposes, but are not really suitable as we are looking for the greatest flexibility. S, CL and CH can all be used and the choice really depends on the type of photography which you do. For the bird photographer, my recommendation would be to set the continuous high (CH) mode. This gives flexibility for tracking a moving subject, burst mode for in-flight shots, and single shot capability for perched birds.

5. **Exposure delay mode:** This depends very much on the subject you are shooting. As mentioned earlier, this allows for a delay between the mirror flipping up and the shutter opening to allow any vibrations to dissipate. I would only set this mode if shooting stationary subjects – it would not be appropriate for shooting birds in flight, for example. If desired, it can be set with the menu option d4, which allows the setting of a delay of 1, 2, or 3 seconds.

6. **Vibration Reduction (VR) or Image Stabilisation (IS):** If you do most of your shooting handheld and your lens has image stabilisation, I would always recommend turning it on.

If you generally use a tripod, the jury seems to be out. Although most reviewers recommend switching image stabilisation on if available in case there is any movement caused by wind, this is not necessarily the advice of the manufacturers. Some manufacturers do provide 2 settings, for either on-tripod or off-tripod use.

I suggest you read your manual and do your own research, but I leave mine switched on whether handheld or on tripod.

7. **Set the AF Area mode:** the AF-On only technique will work with any of the AF area modes: single point, 9, 21 or 51 point dynamic AF area, or 3D tracking. My personal preference is to use the single point area mode.

8. **Set Exposure metering mode:** for bird photography my preference is to use spot metering, but I would use matrix metering for landscape and general photography. The technique works equally well with all metering modes and depends on your personal preferences and techniques.

Using the AF-ON only technique

I am not a fan of the focus/recompose technique. I have 51 focus points which I can choose, and as the exposure is centred on the position of the selected focus point, I prefer this method. Depending on your metering mode there is the potential that when you press the shutter release button, the image will be re-metered at the current position of the active focus point and may result in an incorrect exposure. This is probably more likely if you use spot metering for your bird photography. You could consider using the combined Auto focus/exposure lock button to ensure that re-metering does not occur.— or maybe I am just a “belt and braces” type of guy.

So here is a quick step-through of my process:

1. Compose the image
2. Use the multi –purpose selector to position the active focus point on the primary subject of the image or the point where I require the sharpest focus.
3. Check exposure settings – adjust aperture, shutter speed or ISO as necessary
4. (a) If the subject is stationary, press and release the AF-On button, or
(b) If the subject is moving, press and hold the AF-On button`
5. When all is OK, press the shutter release button. A short press for a single image or hold down for a burst of images.

As you can see, we have now reduced the focusing adjustments to 2 buttons and the choice of either press-and-release or press-and-hold to activate the required autofocus function. What’s more, you can use it with any of the autofocus area modes and also in Live View! That’s the beauty of using this technique – no more fumbling with focus settings when you can least afford to!

Conclusion

In discussing the topic of autofocus and techniques for getting the sharpest image from the 36.3 mega pixels produced by the D800, we are generally agreed that the problems in obtaining the highest quality images are not new. The same or similar problems existed 30 years ago when using slide film and certainly existed in DSLRs using the APS cropped sensor technology.

The D800 has a dynamic range of up to 14.4 stops, over twice that available in colour slide film, and certainly greater than can be viewed on our colour monitors or printed with an inkjet printer. However, while camera manufacturers and image editing software have made it possible to reap the benefits of the advances in image sensor technology; development in the mechanical technology still used in the autofocus/reflex viewfinder and

shutter mechanisms does not appear to have kept pace. We are not yet at the point where we cannot utilise the full capabilities of the new sensor technology – we just have to work a bit harder to overcome the limitations of the mechanical technology.

Finally a quote from Peter Gower which is a probably suitable disclaimer for us all:

“I cannot call myself an expert at getting blurred images however, because every now and then I get a sharp one.”

Bob Young