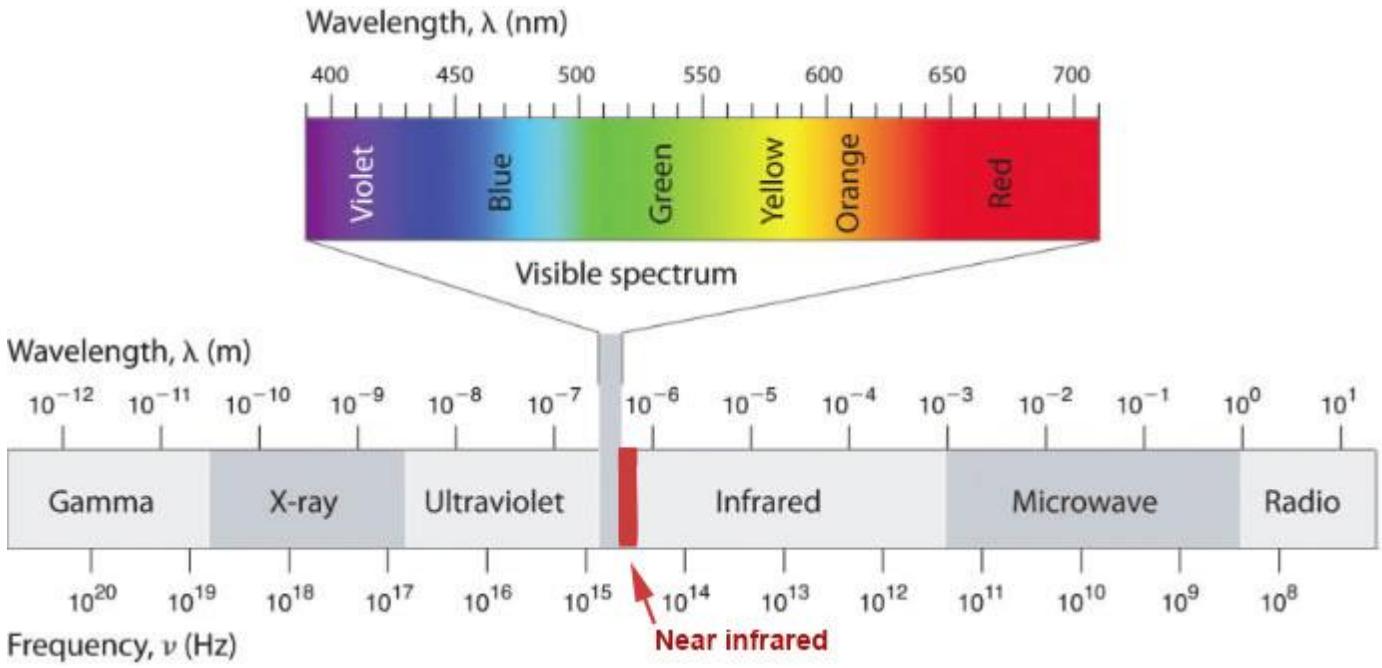
DIGITAL INFRARED PHOTOGRAPHY

By Steve Zimic

If you're looking to break outside the box so to speak, infrared imaging may be just the ticket. It does take a bit of practice to learn what types of scenes will work best, but with digital IR photography, you get to learn on the spot. For me at least, I've found that architecture with foliage is a winning combination. Looking at the two images below, you can see how the color image is just OK, while the IR image is much more dramatic. Because the color of the structure is similar to the green foliage it gets lost in the background, but in the IR image, that is no longer a problem. Of course most architecture is not green but nevertheless manmade structures do not reflect IR very well while foliage does, which usually produces a dramatic contrast between the two.

Shooting trees or any plant for that matter poses some interesting problems. Since the foliage reflects huge amounts of infrared, be it in direct light or shadows, that foliage will typically overwhelm any structure the plant has. For that reason, spring is one of the best times to shoot infrared allowing the branches to show through the budding foliage.

Before I get into how to shoot infrared images, it might help to understand exactly what kind of light we're actually trying to capture. Let's start off with the prefix 'infra' which means 'below'. Since red is at the very bottom edge of the visible spectrum of light, infrared light is therefore below or not visible, to us humans at least. Looking at the chart below, you can see that the infrared range of light is huge compared to the visible spectrum, but digital cameras and infrared film can only see a small portion of that range, appropriately named 'near infrared' implying it's near the visible red light. Infrared heat, like what you feel from a hot radiator, is not something our digital cameras can record. The goal of infrared photography is to capture an image that's comprised primarily of that near infrared light. In order to do that we need to understand why it can be rather difficult to do with your current digital camera.



The image sensor in your digital camera has a glass filter in front of it which serves several purposes. First it protects the sensor from damage, kind of important. Secondly it has a coating which blocks infrared light to varying degrees depending on the manufacturer. This is done intentionally because infrared light can contaminate a full color image with undesirable artifacts - not a good thing. The amount of infrared light blocked by the sensor's filter varies significantly between manufacturers. As a result of this variation, some cameras are capable of wonderful infrared photography with the simple addition of an infrared pass filter on the lens, while others give poor or unusable results.

The easiest way to do infrared photography is to simply buy a screw on infrared pass filter and use your existing camera. This will only work if you have a camera that allows some IR light to reach the sensor. From my experience, most of the late model DSLRs from Canon and Nikon are not good choices. Most mirrorless cameras from Olympus, Sony and Fuji will work quite well. Also the Fuji X10, X20, Olympus X-Z1, and X-Z2 P&S cameras would be an excellent choices although you'll need to purchase a filter adapter. Since even these cameras block some infrared light, putting an infrared pass filter on the camera will cause a rather intense battle between the fliter on the lens and the filter in front of the sensor. As a result the required exposure times will be on the long side, forcing you to either use a tripod or shoot at an ISO of around 1600 for hand held shots. Whatever camera you have, you can do a search for "infrared photography with 'your camera model' ", which will quickly tell you if it's possible.

There are several types of infrared filters available. Some will allow more visible light while others allow none. My personal favorite is the R72 which implies 720nm (nano meters) which if you look at the chart above you'll see is right at the edge of the visible spectrum. If you want a bit more visible light and color you would go with something in the 665nm range, although the infrared results will be slightly less dramatic and are these difficult to find in the screw on type. Regardless of the filter you choose they are all almost completely opaque to the

visible eye. Beware of the really inexpensive filters you may find online, as they're often not as good as name brands such as Hoya, and can often border on being worthless.

My preferred method of infrared photography, is to use a camera that is converted to record only infrared. The procedure entails removing the stock filter in front of the sensor and replacing it with an infrared pass filter - not something you want to do yourself. Again you have a choice of filter types as I mentioned above. Note that once converted, the camera will no longer be able to record conventional color images. Since image sensors are inherently quite sensitive to IR, exposure times will now be similar to the visible light exposures before the camera was converted.
Almost any digital camera can be converted to IR, however P&S, mirrorless and a DSLR with live view would be the preferred choices. With the exception of P&S cameras, you'll need to include a lens with the camera to be converted so that the service center can calibrate the camera to focus properly with IR light. I recommend Precision Camera in Enfield CT for IR conversions. Precision Camera has both the 720nm and 665nm filters available. You can compare the two filters on their website. Whether you send the camera yourself or let Neptune Photo handle it, the price will be the same.
IR converted DSLRs present a unique problem. Since they use optical viewfinders you're not going to be able to preview what the image looks like. Also the metering will be done without regard to the IR filter in front of the image sensor so you'll most likely have to guess at the proper exposure. A DSLR with 'live view' will help with regard to seeing the image, but not all live view DSLRs can meter in this mode.
There is one minor problem with all converted cameras and even non converted cameras known as 'hot spot'. The IR filter covering the sensor is almost black so that it reflects a large amount of light back into the lens. The Anti-Reflective coatings on lens elements is primarily designed to eliminate reflections from light coming into the lens rather than from behind. Also, those AR coatings will not always work as well in the infrared spectrum as they do for visible light. As a result, some lenses will produce a lighter, low contrast area in the center of the image. The size of this area depends on the aperture, typically worse and more distinct at smaller apertures. This hot spot can be tricky to remove in post processing. I have found that camera raw's brush tool, works reasonably well with a slightly negative exposure and higher contrast setting. If you have a late version of ACR or Lightroom, the radial filter used in reverse with similar settings is easier to control.

I'm sure at this point you've had enough of the mechanics of IR photography, so on the next page we'll look at some images and what subjects work well with this type of imaging.

The two images below illustrate the differences between color and IR imagery. The blue sky becomes significantly darker because the blue sky contains very little IR light. Conversely the foliage becomes quite bright due its characteristic of reflecting most of the IR light. Clouds also reflect large amounts of IR light and since this was a slightly hazy day, the sky is considerably brighter than it would be on a clear day.

Both images were recorded within seconds of each other using a standard (unconverted) Olympus EM5 on a tripod. The color image has an exposure time of 1/100 sec at f6.3, ISO 200. The IR image was shot at 2.0 sec at f6.3 and an ISO of 800 using an R72 52mm IR filter. Note the blurred reflections in the water and some of the foliage in the pond due to the long exposure time. Since it was a relatively calm day the long exposure was not a problem but imagine what the foliage would look like on a windy day. So unless you want significantly blurred moving objects, IR photography with an unconverted camera needs to be done in calm conditions.
With a little bit of Photoshop skills you can combine the two images as shown below for an

interesting look. Simply open the two images as layers in Photoshop. Select both layers and auto align them. With the color image as the top layer, change the blend mode to color.

Shooting on a clear cloud free day in a northerly direction will produce almost black skies as shown below. Since there's very little foliage here to convey IR, this image could have been shot in color and converted to B&W with some sepia toning added. The extreme dark sky though might be difficult to reproduce from a color image. The image was made with an IR converted Olympus EPL2 camera that had an exposure time of 1/800 sec at f7.1 and ISO 200 using a 9mm lens (Olympus 9-18 zoom).

Shot on the same day as the above image, you can see in the left image how the bright foliage reveals that this is definitely an IR image. The slight blue cast is a result of the extreme in camera custom white balance shift necessary to prevent the entire image from being red. The adjacent image shows the result of shooting in auto white balance which is perfectly usable if you change the image to B&W or if you just like the color red.....alot.

One of the things I really love about IR images is how clouds become much more dramatic against a dark sky. In this image I added a few birds and accentuated the God beams coming out of the sun that was luckily blocked partially by the clouds. With a plain dark sky this image would have very little impact. Shot with an IR converted Nikon D100 using an 18-70 lens at 56mm. Exposure was 1/100 sec at f8 and ISO 200.

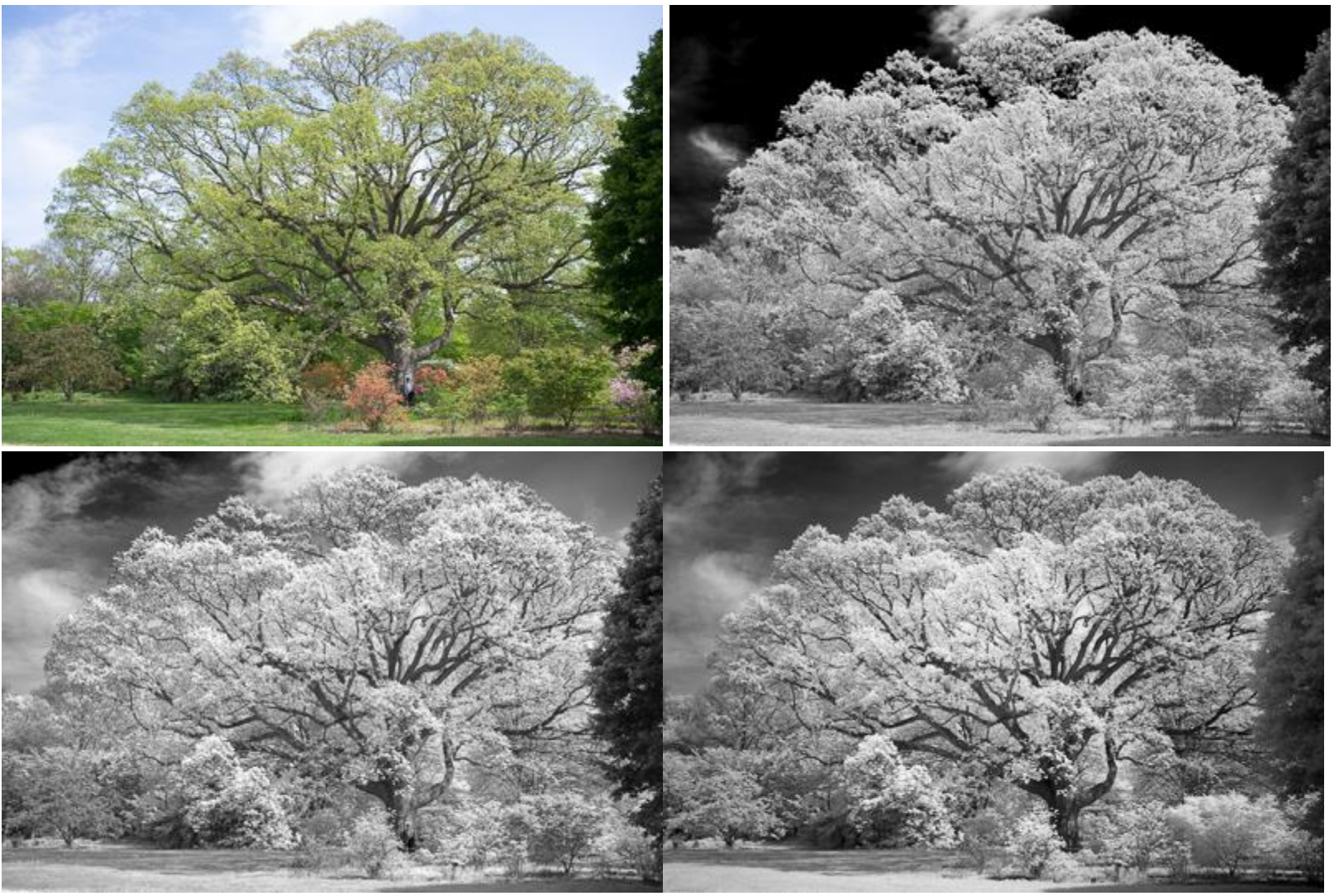
Although IR photography works best on a sunny day, you can get some interesting results on overcast days as well. I shot the below image on an overcast day that appeared to have a totally bland sky. The image on the left is the normally exposed image out of 3 bracketed shots. The image on the right is a result of HDR processing which brought out wonderful detail in the foreground as well as the sky.

Swap Channels

If you don't like the brown sky produced by the IR images you can change the colors in Photoshop using the channel mixer. You can search the web for "infrared swap channels" to see how this is done.

Pseudo IR from color images

If you like the IR look but don't want to shoot real IR images, there are some things you can do within Photoshop. Here's a color image and two pseudo B&W IR images made from the color image. The top right BW image was created in camera raw (or Lightroom) by using the B&W conversion and adjusting the color sliders. The bottom left image was processed in Photoshop using the B&W conversion and similar adjustments. Why the blue sky responds better in camera raw I don't understand, but it's obviously the better choice. And the bottom right image is an image that was shot using an IR filter and converted to B&W. Note that the color image was carefully chosen to show the best possible result for a post IR conversion and not all color images will be as successful. In this particular instance, I actually like the pseudo IR top right image best, with its darker sky.



How to process your IR images on the next page

Shooting IR images in color requires knowing how to set a custom white balance in your camera, otherwise your image will be pure red as shown on below. Setting a custom WB is not necessary if you only want pure B&W images, although you'll probably get a better result by doing so anyway. Perform the custom WB on green foliage in order to render it neutral. If the camera can't handle that (some don't) you can use a white sheet of paper instead which is not optimal but will get you in the ballpark.

To start out you should set the camera to shoot in JPEG mode. You might also want to visit your camera's settings to increase the contrast as IR images can sometimes be a bit flat. The advantage of shooting JPEG is that what you see on your camera screen is what you'll get when you upload your images.

Shooting RAW IR images presents some interesting problems if using an Adobe product. The problem is that on many cameras, Adobe's camera raw (ACR) will not fully recognize the custom WB you set in the camera. You'll know you have this problem if the temperature slider in your RAW processing window is pegged to the left side with no room to move in order to remove the red cast (see image on the left below). If you must use Photoshop, a partial solution is to bring the vibrance setting way down and increase the saturation a bit. A better solution is use Canon, Nikon, DXO Optics, Bibble or Capture 1 software to process the raw images, none of which have the problem of recognizing the camera's extreme WB setting. You can even use Apple’s Preview program to open and adjust the raw files to your liking. Just save the raw files as a TIFF file and then go to Photoshop for the finishing touches. If you prefer pure B&W images none of this is necessary and you can convert the red image to B&W in either ACR or Photoshop.

You can get the WB slider back to a controllable level in ACR by creating a custom camera profile. First you'll need to convert a single IR raw file to the Adobe DNG raw format. This can be easily done via export in Lightroom or from lower left corner of the ACR window using the "save as" command. You'll also need the 'DNG Profile Editor' available free for both Mac and Windows users. Next, navigate to, and open the DNG file from the 'DNG Profile Editor' application. Click on the 'color matrices' tab and set the white balance temperature slider to –50 as a start. Save the recipe and then export the profile to the default location chosen by the 'DNG Profile Editor'. You will need to restart Photshop or Lightroom for this new profile to be available. As long as the profile is in the correct location, the next time you open the camera RAW image in Photoshop or Lightroom, you will see the profile you created in the camera calibration panel's pull down window. The profile will only be available for the camera from which it was created, so don't expect it to be visible when viewing files from other cameras.

The above right photo shows the Lightroom calibration panel. To access the calibration panel in ACR, click the tab which shows a small image of a camera and select it from the pull down list. You do not have to convert your images to the DNG format to use the new profile. Once the new profile is chosen you will see that the WB slider now has enough room for you to color correct the image. If and only if you're using an IR converted camera, save the settings as the default raw develop settings. That way your images will look correct upon initial

import from the camera. Alternately, or for cameras that are not converted to IR, you can save the settings as a preset so they're readily available when you shoot an IR image.

A simpler method would be to adjust the image in ACR or Lightoom for the desired contrast, sharpening, highlight, etc, etc, while ignoring the WB. You can then export or save the image as a 16 bit TIFF file and perform a WB on that image.