



Dennis Freeman

April 23, 2020

Introduction to Infrared Photography

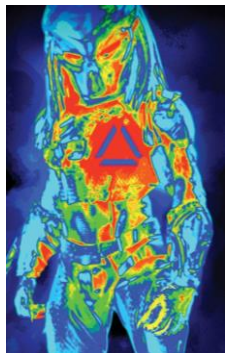
Presentation Outline

- Why do IR & what is it?
- Examples of IR images/subjects/approaches
- How to do IR photography: gear, settings, and post-processing
 - Lens filters on stock cameras
 - Camera conversions
- References

Why Do Infrared Photography?

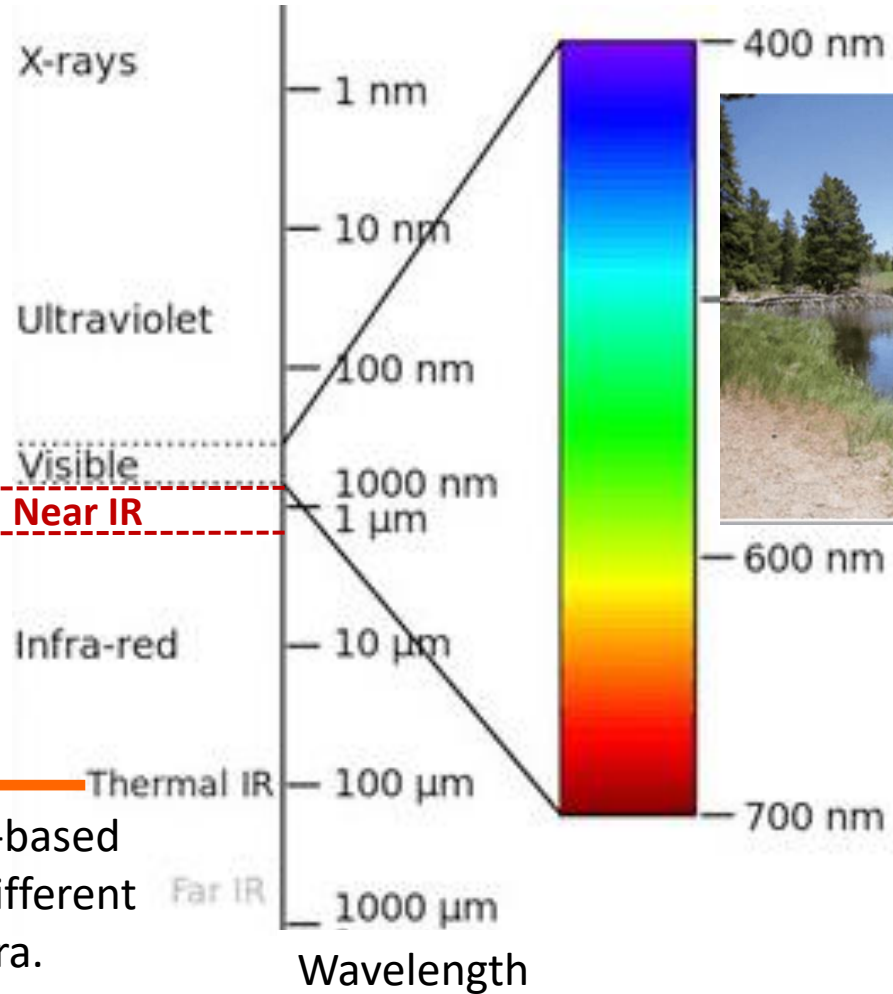
- *For the Drama!*
 - White Foliage
 - Dark Skies and Water
 - Superb High-Contrast Monochrome
- *For the Dreamy Otherworld!*
 - False-Color
 - Unnatural White Foliage
 - Smooths Skin, Removes Freckles & Blemishes
- *For the “Full Sun is Best”!*
 - What to do Between Golden Hours

Infrared Spectrum Context



700 nm
~1400 nm
Near IR

Temperature-based emissions. Different type of camera.



Infrared Light Sources

- The Sun (is the best)
- Incandescent & Halogen Lights
- Camera Flashes work (cover w/ IR filter or gel for dedicated IR flash) – possible White Balance issues
- A Full-Moon
- IR LED's (watch their wavelength vs your filter)
 - IR Tactical Flashlights

Won't Work:

- Fluorescent Lights
- Household LED Lighting

Bag of Tricks All Work in IR

- Polarizing Filters
- Neutral Density Filters
- Panoramas
- HDR (High Dynamic Range)
- Flashes
- Diffusers
- Reflectors
- Macro



Black & White



*By Deborah Sandidge
Converted Digital Compact Camera, B&W*



Porch Post by Bob Catlett



By Mark Hilliard

False Color



By Eduardo Libby



By Bob Vishneski



By Deborah Sandidge



By Tony Sweet

Deborah Sandidge
Birds are Excellent Subjects



Gnarled Trees are Great too.
Deborah Sandidge

Flowers

Deborah Sandidge

*Flash IR Photograph
Deborah Sandidge*



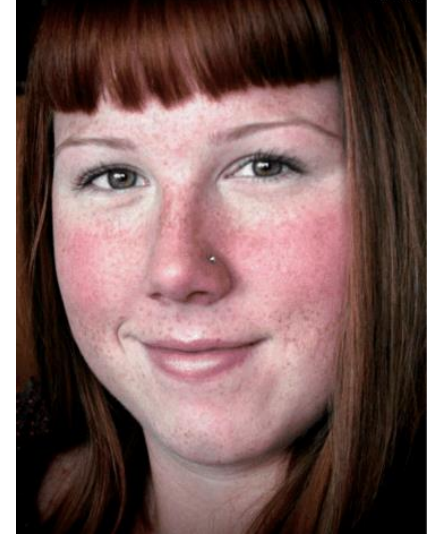
Wildflowers From Low Angle Against Sky

These are
Sunglasses!

Smoothed Skin



By Bob Vishneski



Same Person



By Deborah Sandidge

People



*Freckles & Blemishes Disappear
By Deborah Sandidge*



Deborah Sandidge Early Morning Leading Lines



*Deborah Sandidge
Afternoon Clouds Contrast with Black Sky*

All Times of
Day, and
Midday is
Great





Night Shot: Tail Lights are White! Photoshop Cross Screen Filter for Light Stars

Even at Night,
and Fake Night

Deborah Sandidge

IR in Afternoon, cloudless: Add Deep Blue Tone & Moon



3-11



Deborah Sandidge

Pastel Coloring added to IR with Software Filters

False Color (665nm Filter)

Channel-Swap Color
or Software Effects
Color

4-4





Deborah Sandidge

Winter Shot. Sepia Tones & Blurring Filter

Vignette Blur for Vintage Camera Look

Old Time Photography Effects



3-12



Lensbaby adds Softness

Deborah Sandidge

Morning Sun Contrast



Soft or Stark



Multi-Shot HDR – Photomerge in Photoshop

HDR Can Help
with High
Contrast in IR

Deborah Sandidge

HDR Emphasizes Sharp Details





Color Image

Deborah Sandidge



720nm IR Image



Layered Blending and Filters

Composites
with
Photoshop
Layers





Deborah Sandidge

By Tony Sweet

Composite: Color Photo + IR Photo in Photoshop Layers, Blended w/ 80% Opacity

And More
Composites
with Photoshop
Layers



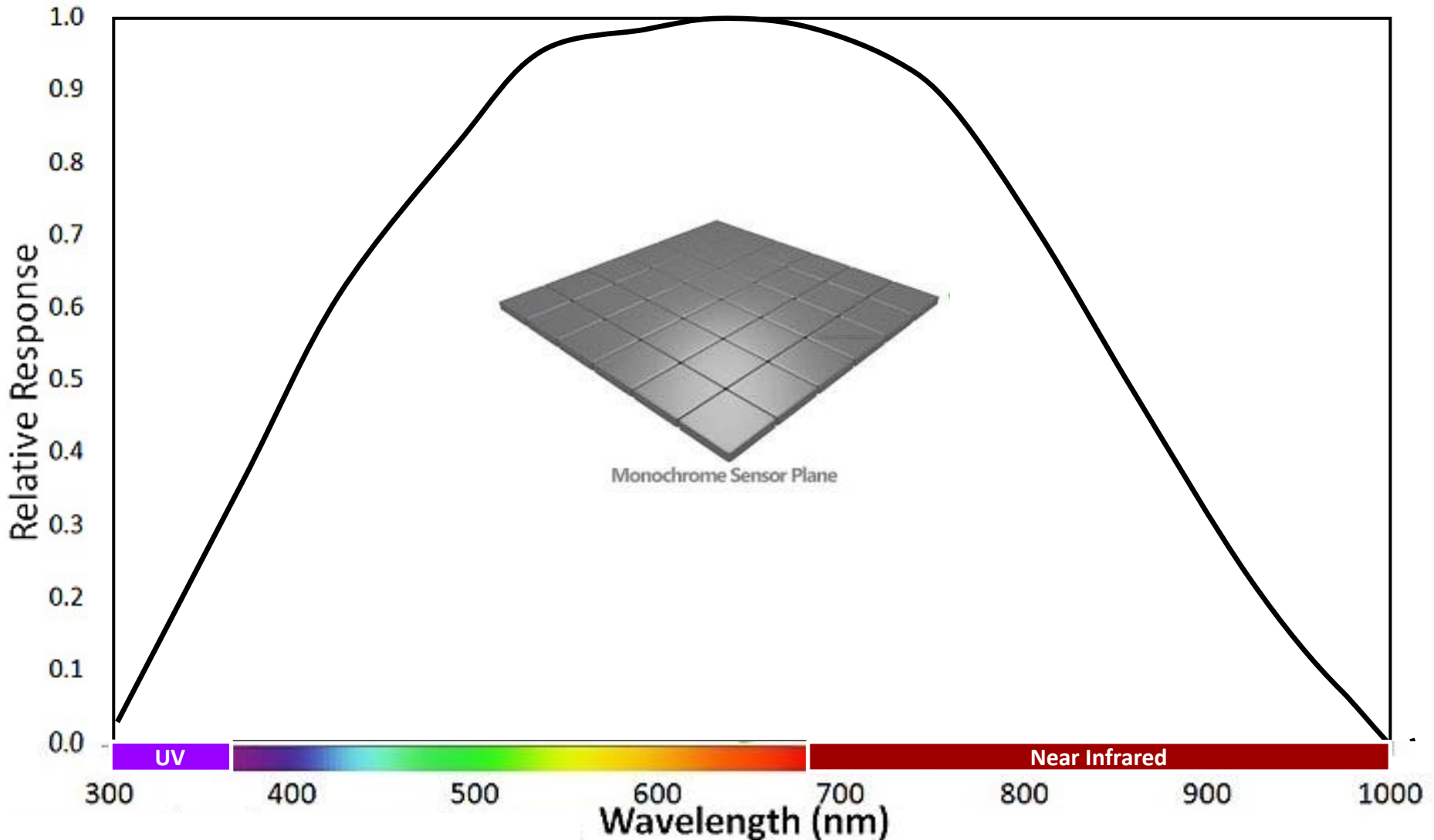


What Does Your Camera Bring To The Infrared Party?



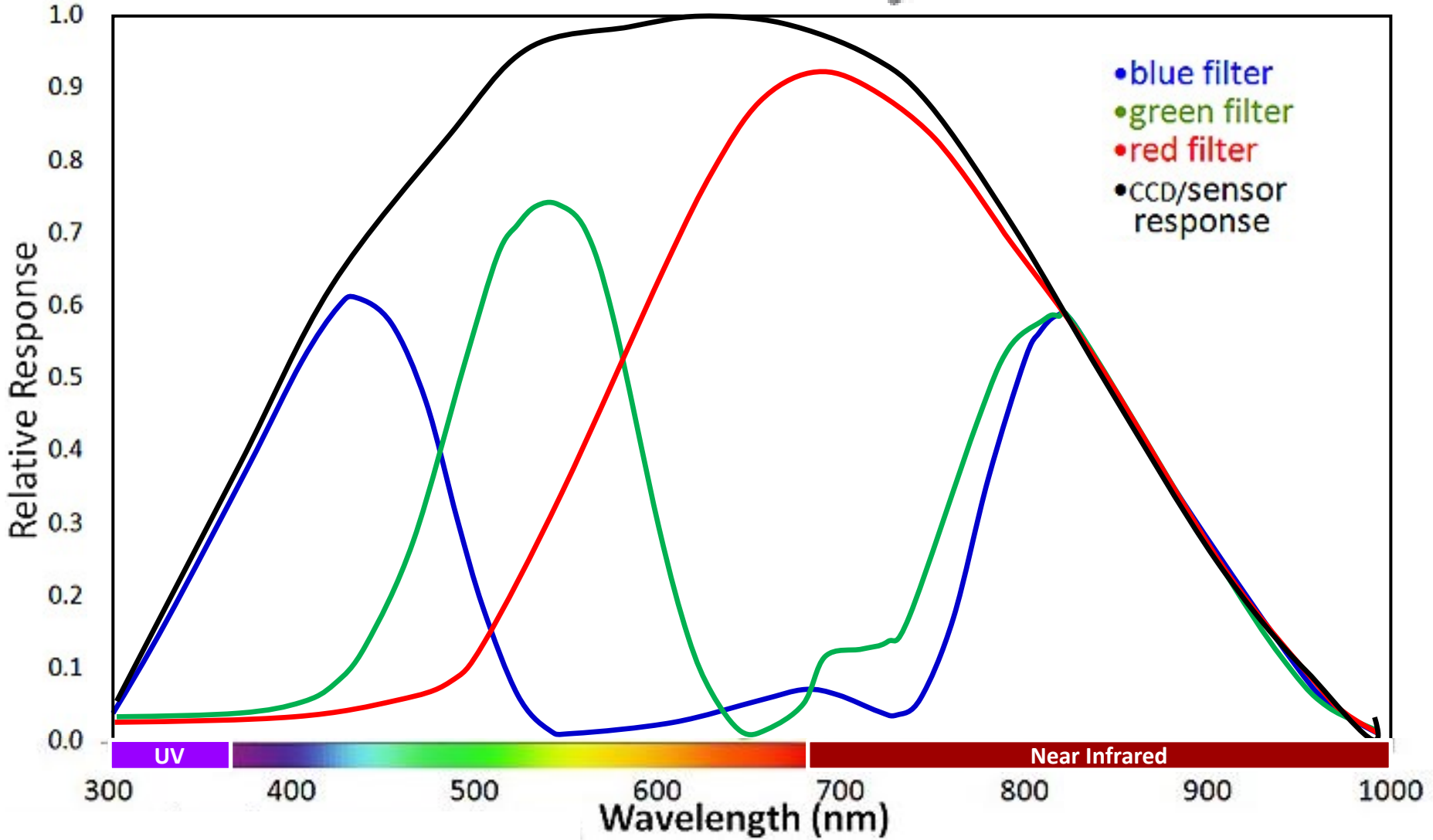
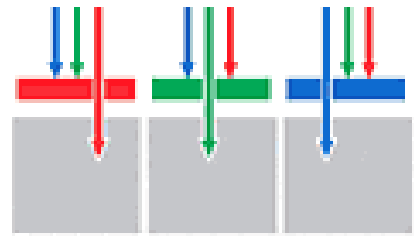
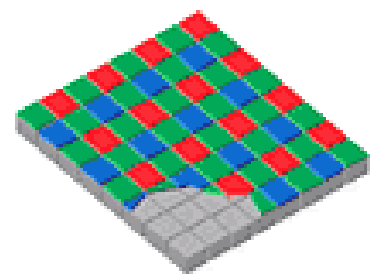
Camera Pixel Response:

Sensors are multi-layered, starting w/ the CCD Array



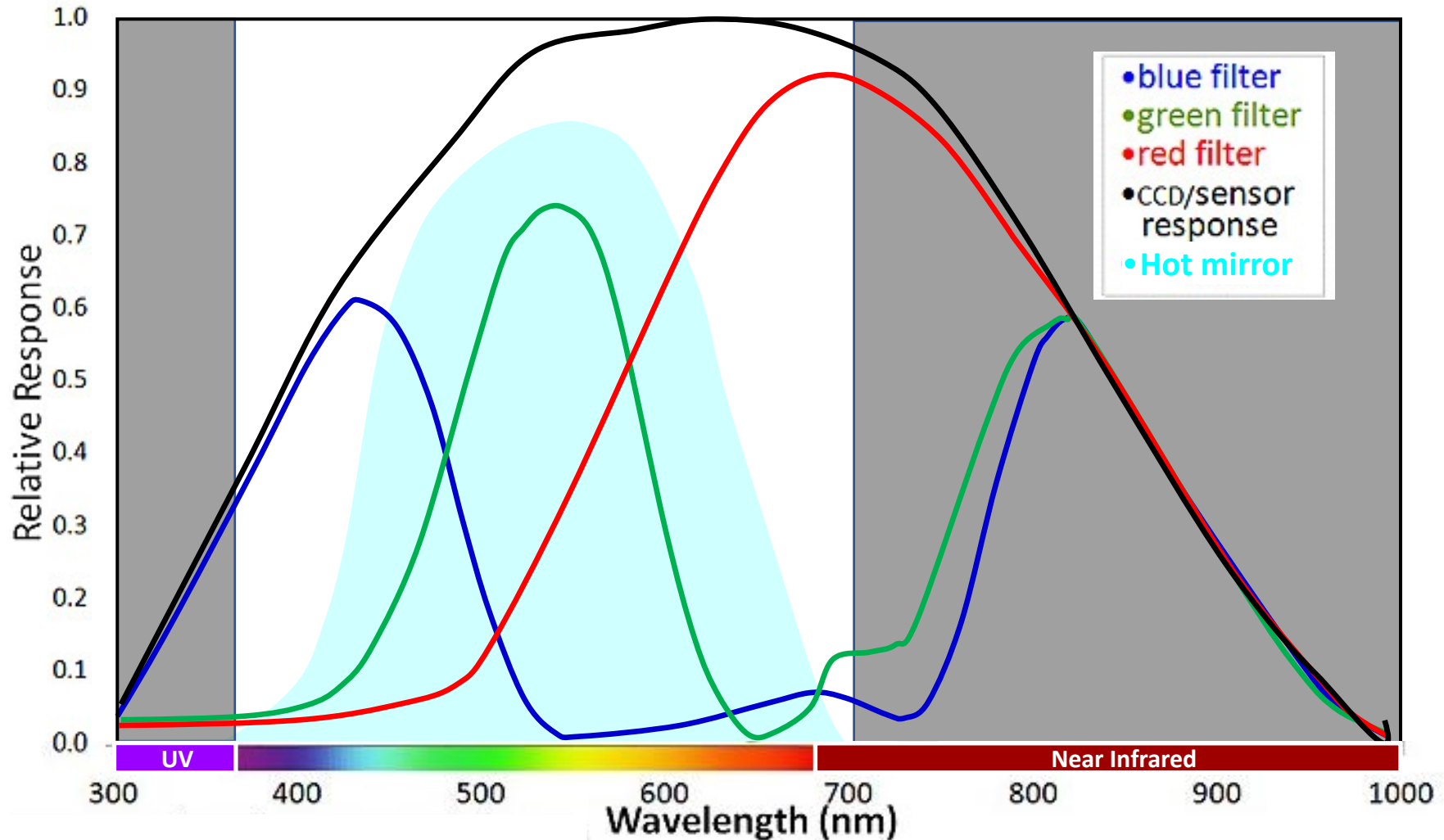
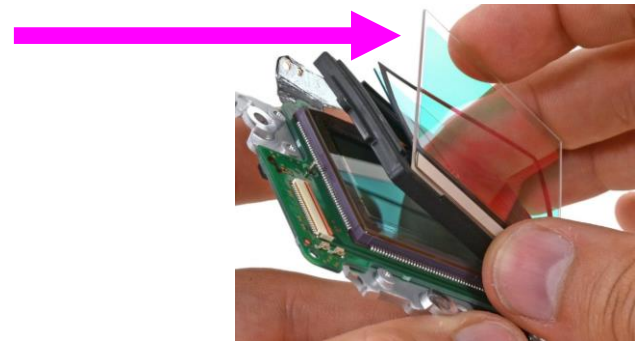
RGB Mosaic Filters

Layered on CCD

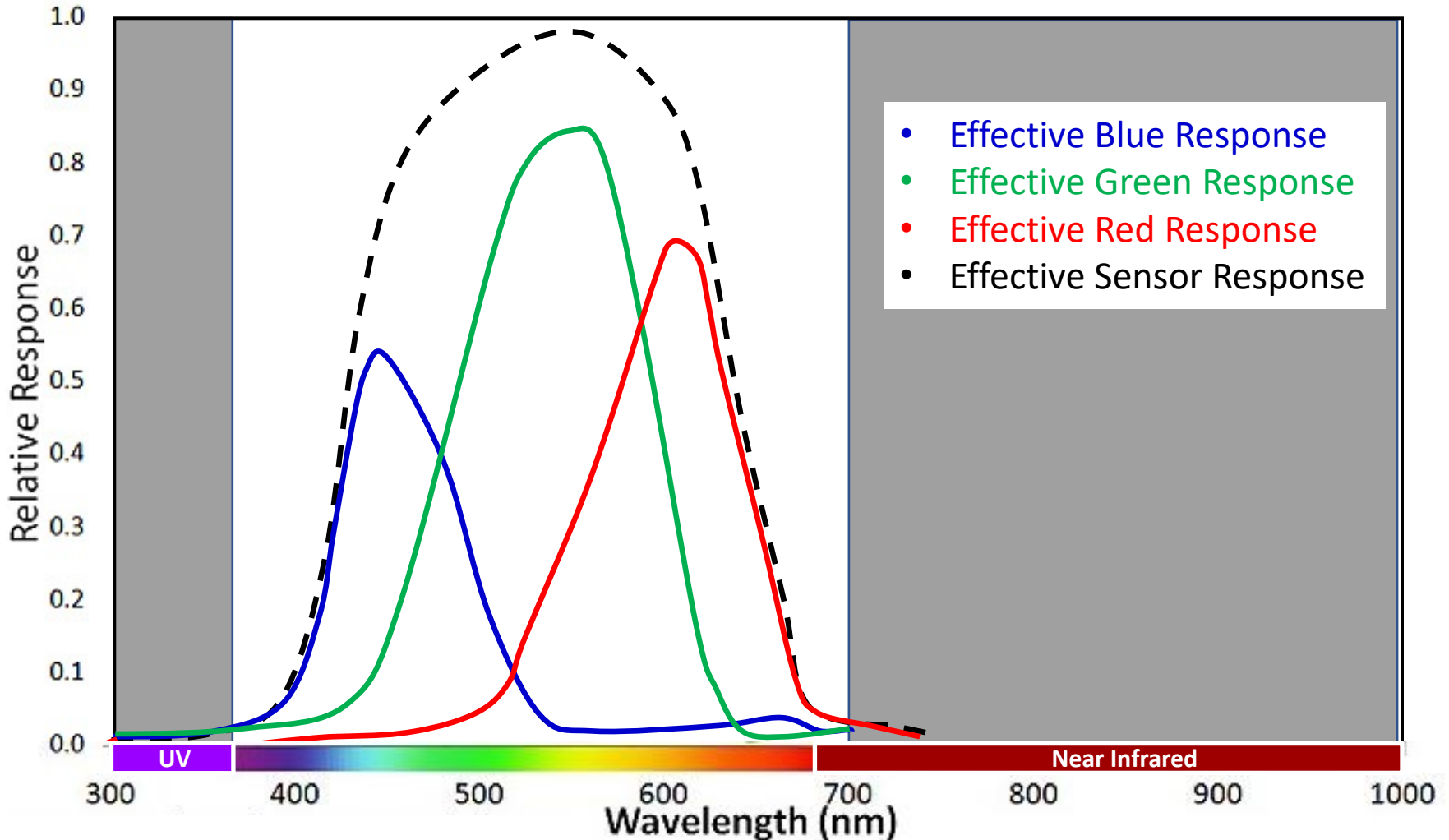


Hot Mirror Filter

Removes UV & IR



Cumulative Camera Response with Hot Mirror Filter: No IR



Options for Taking IR Photographs

1. Use a stock camera and lens with screw-on IR filter(s) that passes IR and blocks visible light.



2. Have a camera converted to IR permanently.



1. Lens IR Filters



- IR filter makers: Hoya, B+W, Ice, Heliopan, Cokin, Singh-Ray, Maxmax
- Is the least expensive option, ballpark: ~\$60-\$180.
- No permanent mods to camera or lenses.
- IR Filter blocks visible light, passes IR
- Lens IR filter wavelengths:
 - Need 720nm and longer wavelengths
 - Shorter wavelengths (e.g. 590 nm, 665 nm) won't work on stock cameras
- Results: Limited False-Color (720nm) and High-Contrast B&W

IR Lens Filter Characteristics

Direct from Camera,
Custom White
Balance

Channel Swapped
i.e. "False Color"
(Photoshop)

Black & White

Direct from Camera,
Auto White Balance

720nm
Filter



850nm
Filter



N/A



Basics for Using IR Lens Filters

- Depending on camera, IR filter, ISO, and aperture setting, shutter speeds of up to 30 seconds, or even *minutes*.
- Need a tripod and remote trigger (or 2 sec delay)
- Need to compose without the IR filter (viewfinder and Live View are useless with filter on)
- Need to correct the focus – different focus point in IR
- Any of the canned White Balance choices will result in very red image – monochrome or Custom White Balance is better for composition, work in Lightroom, or jpeg results
- Shooting in RAW strongly encouraged for post-processing

Some cameras work better with an IR lens filter than others

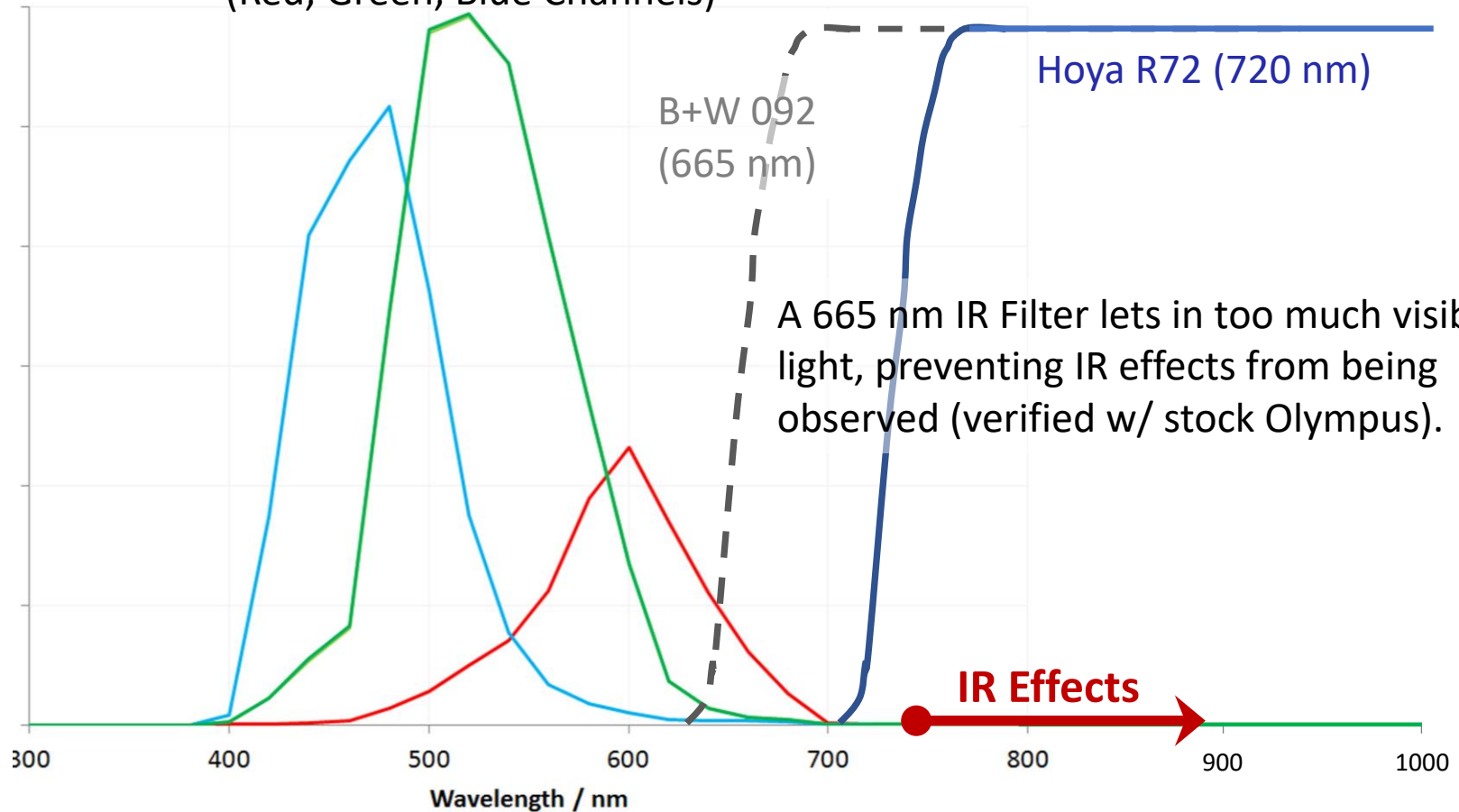
Some cameras are tougher candidates for adding a lens IR filter. They filter out the IR too well. Do a test with your **TV remote control (940 nm)**. Take a picture with the stock camera (no IR filter) while pushing a button on the remote. Is the light bright? If so, the camera is 'leaking' enough IR for faster shutter speeds.



Canon 5D IV — 2.7 stops brighter —> Olympus EM1 II

Stock Camera & IR Filter Responses

Canon 5D Mark II
(Red, Green, Blue Channels)

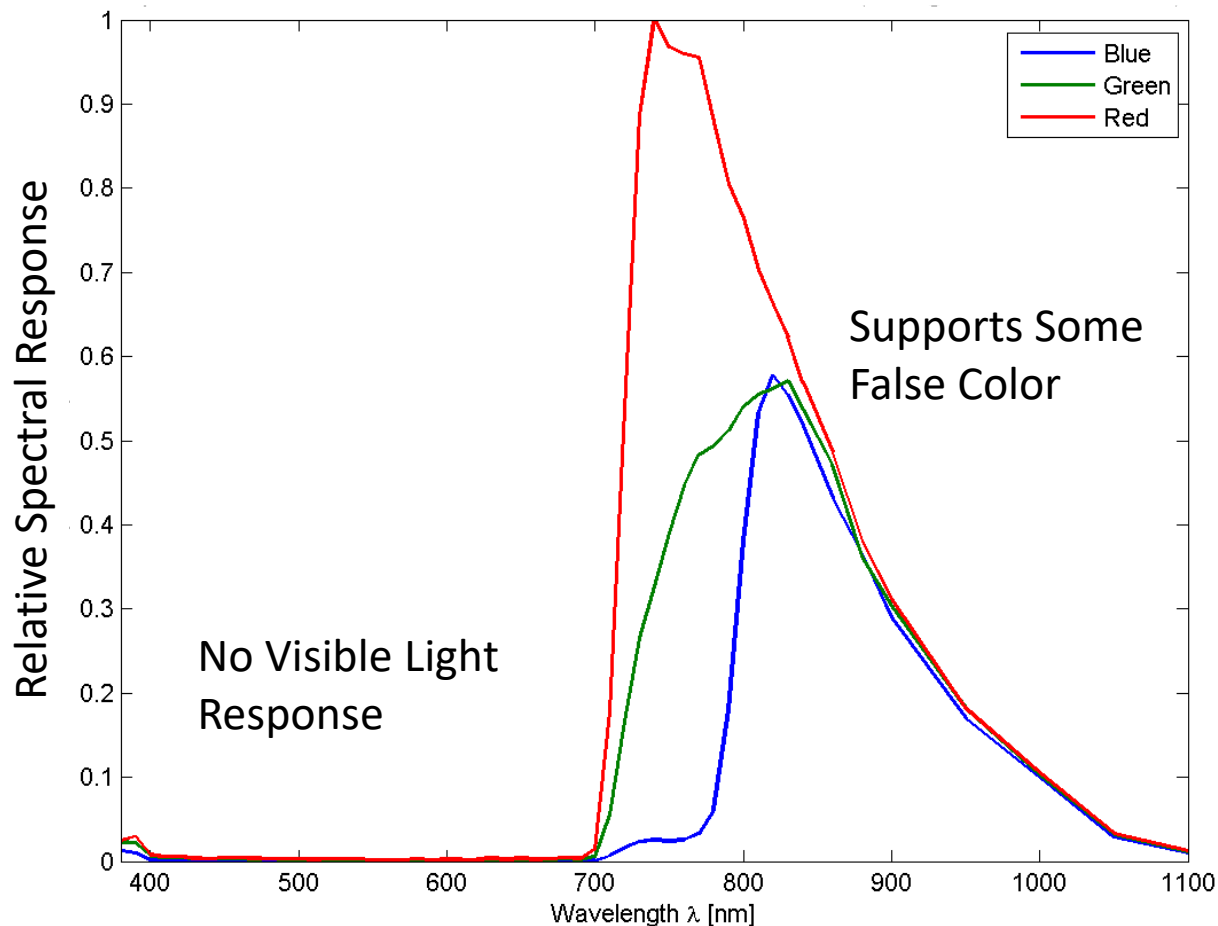


A 665 nm IR Filter lets in too much visible light, preventing IR effects from being observed (verified w/ stock Olympus).

Use a 720 nm or Longer Wavelength IR Filter

Canon 5D Mark II with Hoya R72 (720 nm) Filter – Combined Response

Response is ~10 Stops Below a Visible Light Source of Same Intensity and no Filter



Gear Requirements



Bulb (for > 30 sec)



Intervalometer-style remote useful for controlling shutter speeds > 30 sec

Focusing with a Lens IR Filter

- A 720+ nm IR Filter is so dark on a stock camera that using the camera's autofocus, viewfinder, or Live View is not going to work.
- Remove the IR filter. Either autofocus or manually focus on your subject as usual. Switch to manual focus. Correct the focus for IR as follows:
 - If your lens has IR focus offset marks (red lines) use them (e.g. 24-105mm f/4 lens):



Visible Light Focus



Rotate focus ring to right, aligning visible focus distance to red line corresponding to focal length.



Infrared Focus at 50 mm focal length

- No IR marks? Bracket your focus via trial-and-error. Figure out the IR offsets and make marks on lens for future. Sorry.

2. Camera Conversion



A company removes the 'hot mirror' filter that blocks IR & passes visible light. Replaces with a filter that blocks visible light & passes IR.

Conversion Benefits

- No external lens filters needed
- See through DSLR viewfinder normally
- Much brighter camera preview image
- Functional autofocus / exposure metering
- Typical shutter speeds / ISO
- No tripod necessary
- Use all of your lenses (for fixed IR wavelength conversion)
- Can photograph moving subjects
- More wavelengths available (for false-color):
550 nm, 590nm, 665nm, 720nm, 850nm

Typical IR Conversions Costs



Canon DSLR Infrared Conversion

★★★★★ 24 customer reviews

\$275.00 + Options



Nikon DSLR Infrared Conversion

★★★★★ 29 customer reviews

\$275.00 + Options



Panasonic P&S Infrared Conversion

★★★★★ 2 customer reviews

\$175.00 + Options



Pentax Mirrorless Infrared Conversion

★★★★★ 1 customer review

\$350.00 + Options



Olympus Mirrorless Infrared Conversion

★★★★★ 7 customer reviews

\$275.00 + Options


















Fujifilm DSLR Infrared Conversion

\$275.00 + Options

- Life Pixel
<https://www.lifepixel.com>
- Kolari Vision
<https://kolarivision.com>
- Spencer's Camera
<https://www.spencerscamera.com/>

'Options' = Specific Camera Model, Filter Type, Focus Calibration Options: say ~\$75 more

IR Conversion Characteristics

	Direct from Camera, Custom White Balance	Channel Swapped	Black & White	Direct from Camera, Auto White Balance
590nm Filter				
665nm Filter				
720nm Filter				
850nm Filter		N/A		

More False Color ↑

More Contrast
Sharper ↓

Conversion Flexibility



- Can add any longer wavelength lens filter to a conversion to get the effect of the longer wavelength:
 - e.g. 665nm conversion + 720nm or 850nm lens filter = 720nm or 850nm conversion.
 - Can't add a shorter wavelength lens filter.
- Can get a **Full-Spectrum (FS)** Conversion + lens filters for any UV or IR wavelength. FS is clear glass – let's everything through:
 - FS + Hot Mirror lens filter = unconverted camera! Regular visible light photos.
 - FS + {590nm, 665nm, 720nm, 850nm} lens filters = {590nm, 665nm, 720nm, 850nm} conversion equivalents.
 - FS + UV lens filter = UV conversion equivalent.
 - FS not useful unless used with a lens filter. **Need filters for each of your lenses** (or step up filter rings)
- Can get a **Two-Spectrum** Conversion + lens filters for any IR wavelength
 - Same as FS except UV is blocked.
 - Better color rendition in visible light photography than full-spectrum.

Focusing a Converted Camera

- Autofocus works fine w/ DSLR's in "Live View", with mirrorless cameras, and with point-and-shoots:
- DSLR cameras typically use **phase detection** autofocus - **depends on wavelength**. During the conversion, the DSLR needs to be calibrated to a specific lens (e.g. Canon 50mm f/1.8). Each lens has a *different* infrared focus shift. Or you can have your DSLR calibrated to visible light and use the infrared focus marks on your lens for correction.
- In "Live View" mode, your DSLR will use **contrast detection** autofocus. This is also used by most **mirrorless cameras**. It is **independent of the wavelength**. Focus & shoot like normal!

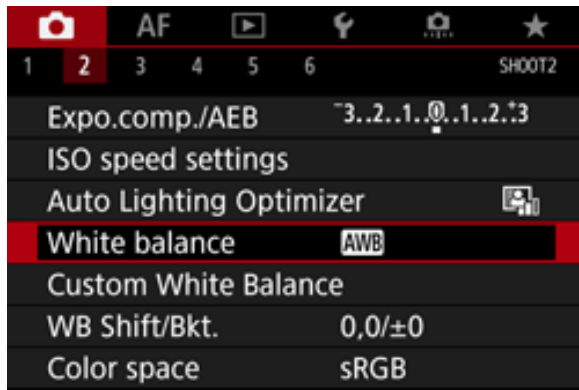
To get the Best Results in IR with either Lens Filters or Conversions:

- In-Camera Custom White Balance
- Shoot in RAW
- Use White Balance Profiles for Post-Processing
- Lens Hot Spots: Avoidance & Correction
- False Color Post Processing (when doing color)

Camera White Balance Settings

Custom White Balance setting useful for jpeg products, composing, and Lightroom. Does not effect RAW format data for further (Photoshop) post-processing (e.g. “false-color”).

Auto White Balance



result



“Custom” or “Manual” White Balance



Use an IR photo of WB subject: out-of-focus foliage or white card in full sun (use “sunny” WB for grass).



result



Lens Hot Spots in IR



Hot spots are a common complaint in IR.

Black matte lens barrel coatings work well to prevent visible light reflections from the inside of the barrel – but not for IR.

High-end lenses have coatings to prevent reflections in visible light – not IR. Can make it worse.

- #1 Culprit is the Lens – Some are good, some are terrible
- Aperture – Wide open is best, worse at small apertures
- Focal Length – For zooms, hot spots worse at some focal lengths
- Focus Point – hot spot varies. Large depth of field may defocus hot spot.
- IR intensity in the scene – bright is worse

<https://kolarivision.com/articles/lens-hotspot-list/>

Problem can be corrected with a separate hot spot reference image (using translucent plastic) & Lightroom or Capture One

Post-Processing IR Filter Images

IR Image
- RAW

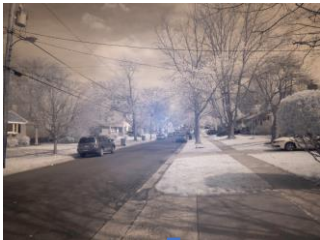


Image of IR hot
spot - RAW



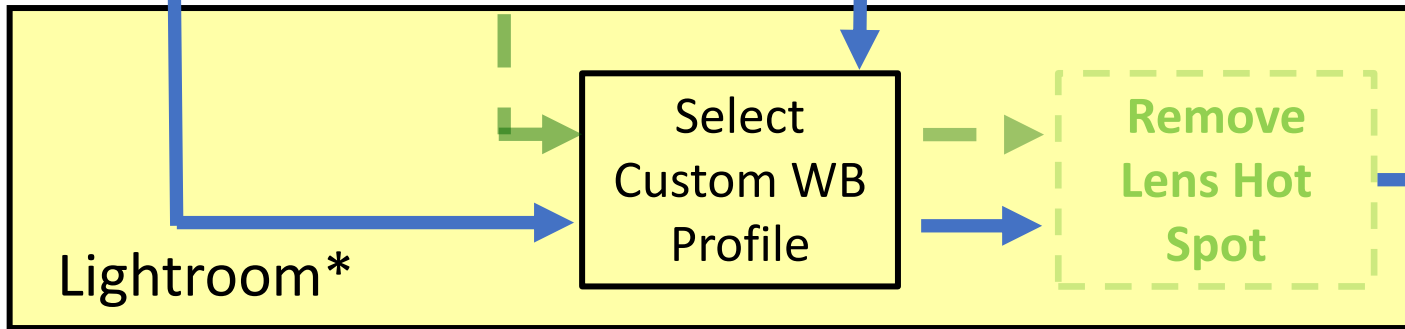
Just the first time
(free software)

Adobe DNG
Profile
Editor

[name].dng



Options include
False-color, B&W



Lightroom*

Select
Custom WB
Profile

Remove
Lens Hot
Spot

Further Edits:
(Photoshop,
Silver EFEX,
Topaz DeNoise
AI, ...)

*Or Capture One
(see Ken's article – Jan. CR)

Library > Flat-Field
Correction

Issue Retaining Custom WB Profile



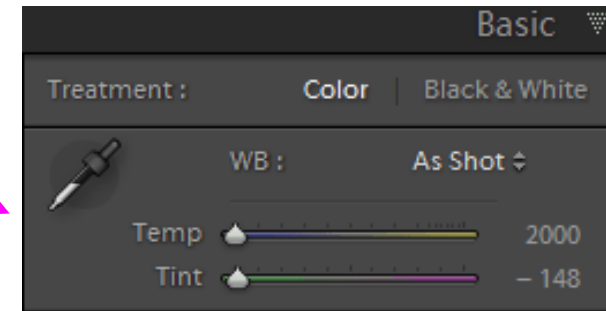
Camera Auto WB



Out of Camera: Custom WB



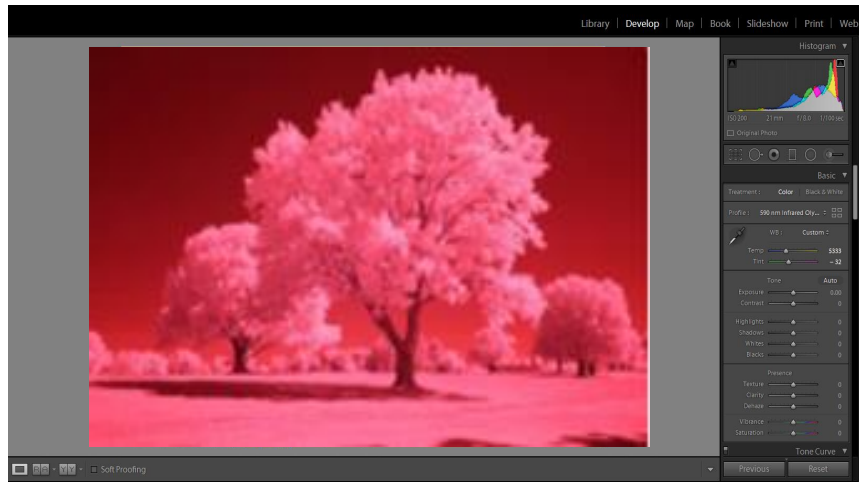
Import RAW into Lightroom



Lightroom default color profiles set max color temp to 2000 K. Can't move slider to adjust.

Make a Camera White Balance DNG Profile

<https://robertreiser.photography/proper-infrared-white-balance-in-lightroom/>



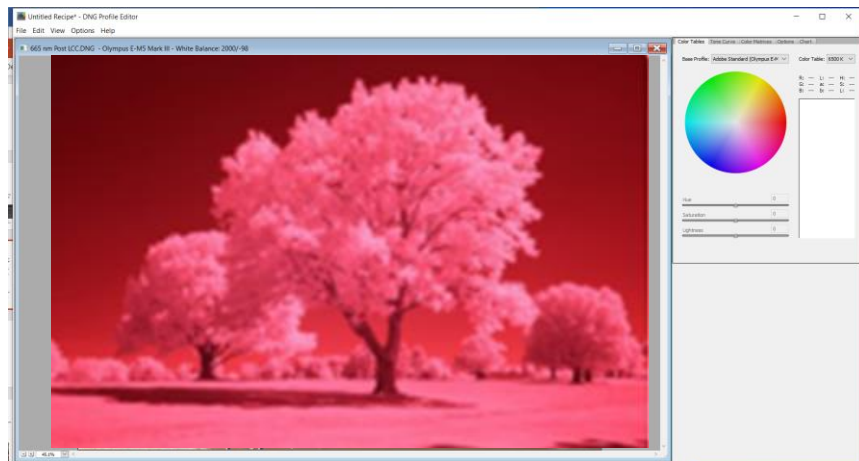
Export image as a DNG file. Make sure to use a RAW image with lots of foliage for this one-time step.

Download [Adobe DNG Profile Editor](#), which is available for free. The version on Adobe's website is from September 2012 – that's fine.

Run the Adobe DNG Profile Editor and open the DNG file you just created by selecting *File*, then *Open DNG Image...*

Depending on your IR filter type, create either a profile for **color infrared photography** (usually used with filters below 800 nm), or **black and white infrared photography** (usually used with filters above 800 nm).

Assume a color profile for the example ...

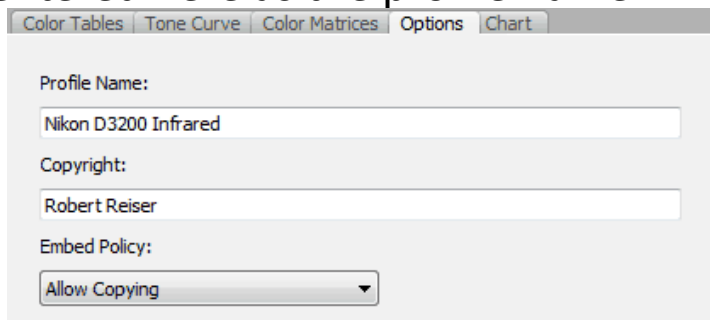


Make Camera White Balance DNG Profile

Assume Color infrared profile:

On the right side of the screen, you will see a tabbed interface for the settings. Select the *Color Matrices* tab. Now **drag the *Temperature* slider to the far left (or until neutral looking if image starts getting bluish). Don't touch other sliders.**

Select the *Options* tab and provide some information about the profile and the author. This is not required, but will help you later as Lightroom uses the name entered here as the profile name:

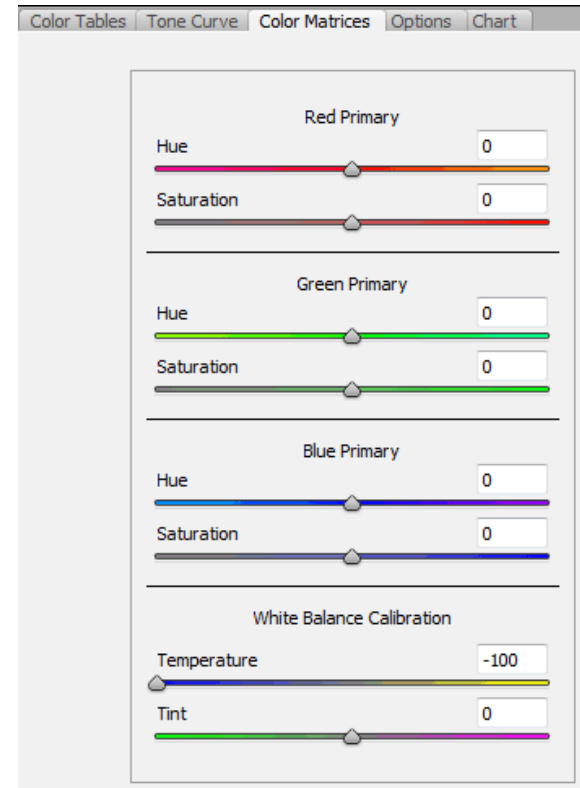


Color Tables | Tone Curve | Color Matrices | Options | Chart

Profile Name:
Nikon D3200 Infrared

Copyright:
Robert Reiser

Embed Policy:
Allow Copying



Color Tables | Tone Curve | Color Matrices | Options | Chart

Red Primary

Hue 0

Saturation 0

Green Primary

Hue 0

Saturation 0

Blue Primary

Hue 0

Saturation 0

White Balance Calibration

Temperature -100

Tint 0

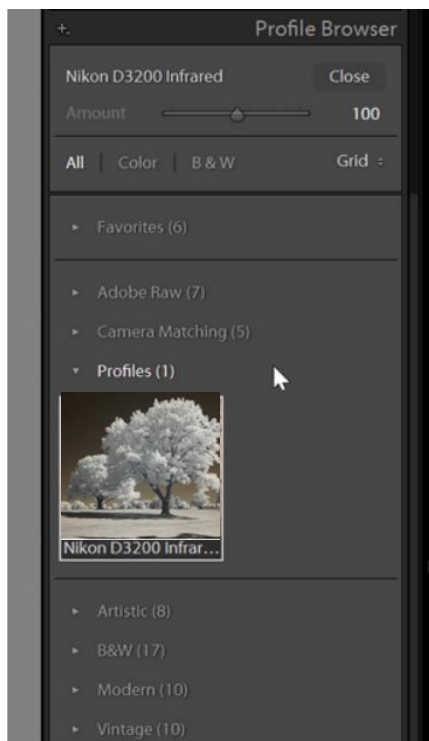
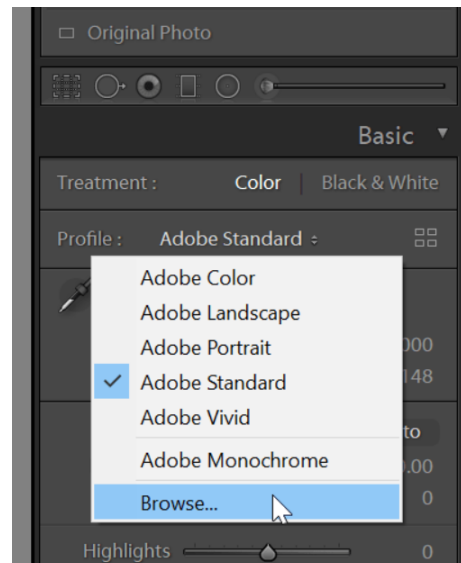
Select *File*, then *Export Profile*. Make sure that the profile is saved to the correct folder for your operating system:

- Windows:** C:\Users\{username}\AppData\Roaming\Adobe\CameraRaw\CameraProfiles
- Mac:** /Users/{username}/Library/Application Support/Adobe/Camera Raw/Camera Profiles/

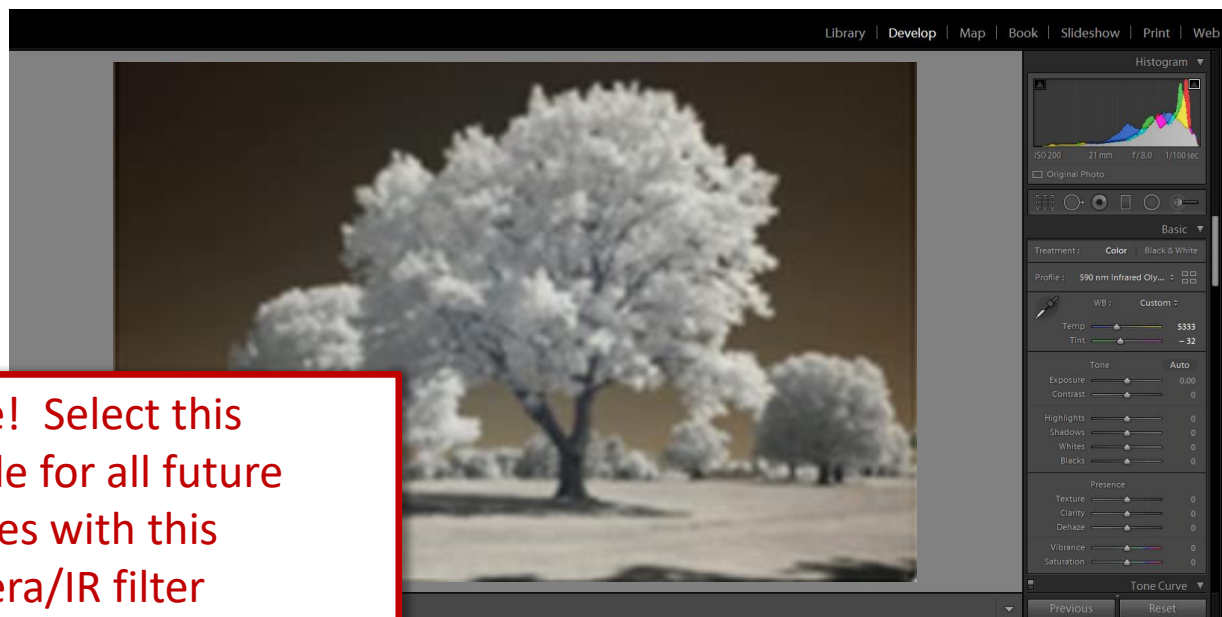
Use Custom DNG WB Profile

Close and then re-open Lightroom.
Click on Color Profile pulldown.
Select *Browse ...*

Scroll down to the *Profiles* entry and click on it to expand the section. Click on your profile to apply it to the current picture:



Done! Select this profile for all future images with this camera/IR filter



Lens Hot Spots Correction



e.g. Digitalback.com
Pocket-LCC

Take RAW photo with a hot spot.
Keep the settings the same (focal length, focus, aperture, camera position)

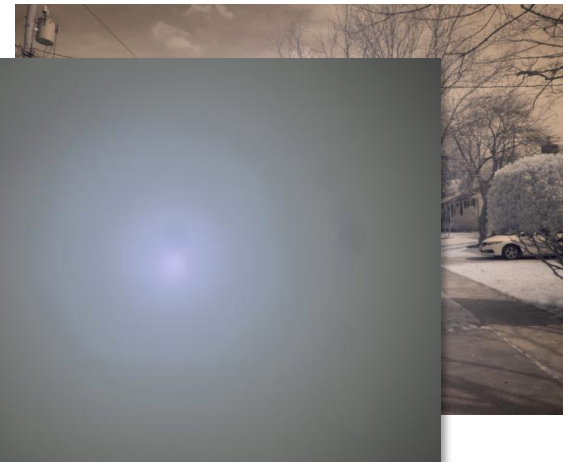
Put translucent plastic tight against lens and take a RAW hot spot reference image.



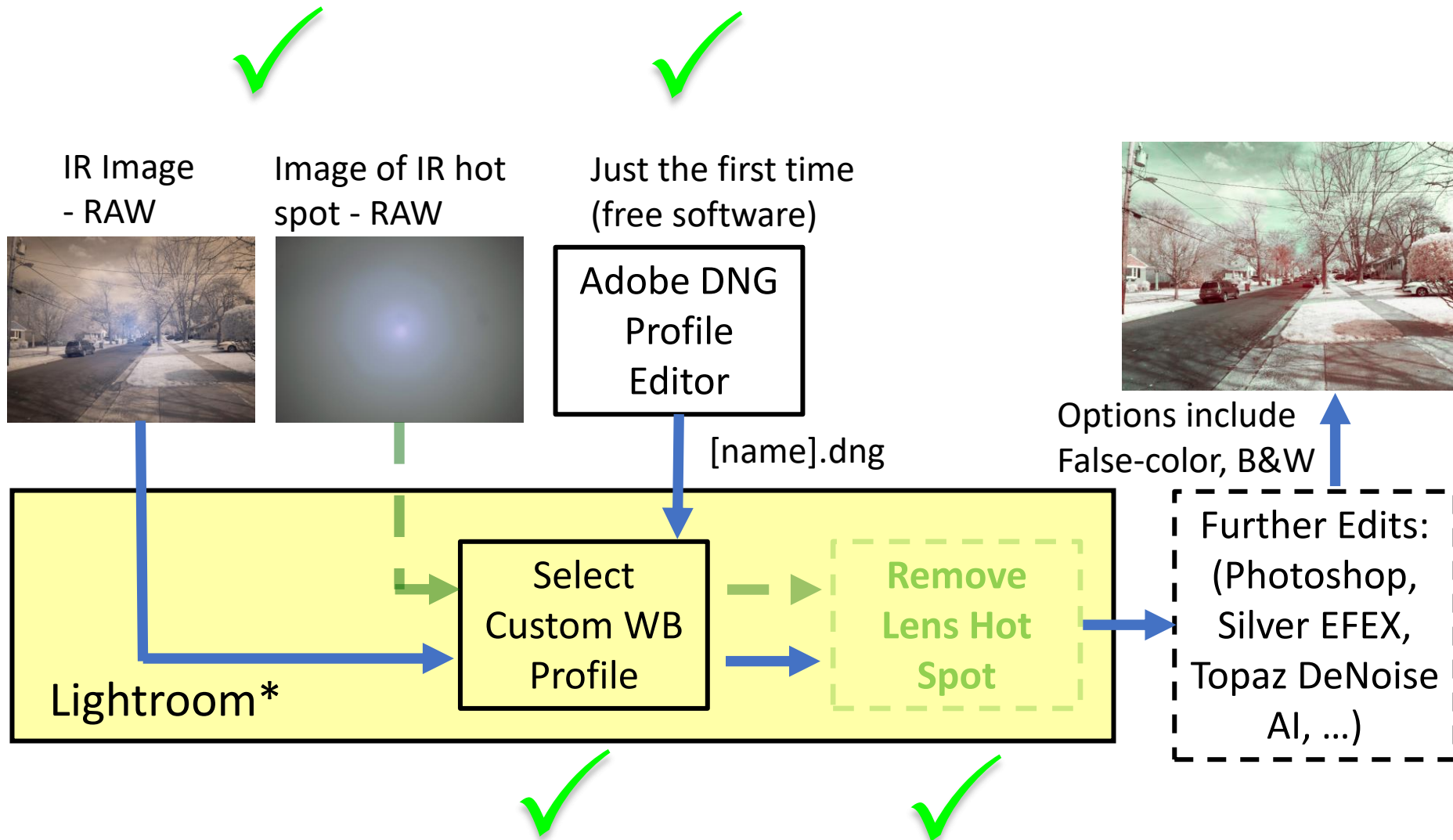
Remove luminance and color effects of hot spot (and sensor dust too!)



- Lightroom Flat-Field Correction or
- Capture One



Post-Processing IR Filter Images



Photoshop – False Color

<https://photographylife.com/how-to-process-infrared-photographs>

1. Adjust the Channel Mixer:

- Red Channel: Red = 0, Green = 0, Blue = 100
- Blue Channel: Red = 100, Green = 100, Blue = -100
- Green Channel: Red = 0, Green = 0, Blue = 100

Vishnecki Preferred Swap

or

- Red Channel: Red = 0, Green = 0, Blue = 100
- Blue Channel: Red = 100, Green = 0, Blue = 0
- Green Channel: Red = 0, Green = 100, Blue = 0

Traditional Red/Blue Swap

2. Add HUE/SATURATION Layer

3. Add Curves Layer – “S” Curve for enhanced contrast

4. Silver EFEX Plugin – Add Structure, adjust colors

Blend Mode = Luminosity

Adjust Opacity

5. Topaz DeNoise and InFocus Sharpening Plugins [new AI versions]

Example Sequence of Steps by Bob Vishneski from PhotographyLife.com ...



Bob Vishneski

RAW File In Lightroom



Bob Vishneski

Traditional Red & Blue Channel Swap



Bob Vishneski

Vishnecki Channel Swap



Bob Vishneski

Change Blue Hue



Bob Vishneski

Adjust Contrast in Curves



Bob Vishneski

Silver EFEX IR Structure

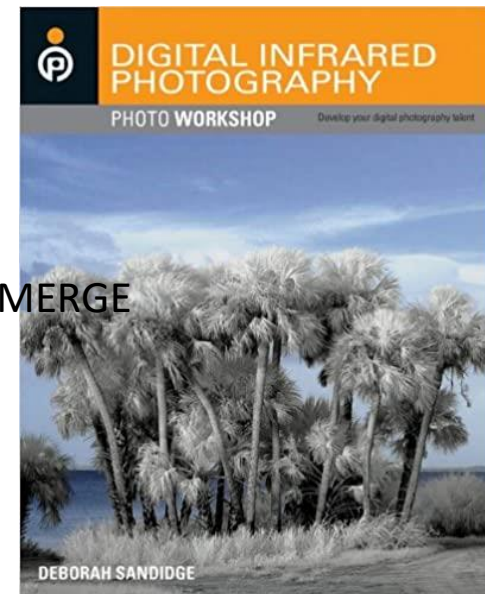


Bob Vishneski

Silver EFEX – Change Blend to Luminosity

Intro & How To Resources:

- YouTube: [Infrared Post Processing Tutorial](#).
 - Websites: [RobertReiser.Photography](#),
 - <https://photographylife.com/how-to-process-infrared-photographs>
(and other articles by Bob Vishnicki at PhotographyLife.com)
 - Lynda.com (free through Montgomery County Library)
 - Warrenton-Manassas CC Presentation:
 - <https://www.dropbox.com/s/mk4nr28dn6ewi8a/Infrared-Photography-Part-1-SM.pdf?dl=0>
 - <https://www.dropbox.com/s/9jtvj8c77u6vefv/Infrared-Photography-Part-2-SM.pdf?dl=0>
 - \$14 eBook: [https://book4sales.com/Digital Infrared Photography by Deborah Sandidge](https://book4sales.com/Digital%20Infrared%20Photography%20by%20Deborah%20Sandidge)
 - Contents:
 - 1 INTRODUCING INFRARED LIGHT
 - 2 VISUALIZING AND CAPTURING IR IMAGES
 - 3 ESSENTIALS OF IR COMPOSITION
 - 4 CAPTURING SPECIFIC SUBJECTS
 - 5 SPECIAL EFFECTS FOR CREATIVE IN-CAMERA IMAGES
 - 6 PLANNING AHEAD FOR HIGH DYNAMIC RANGE AND PHOTOMERGE
 - 7 PROCESSING IR IMAGES IN PHOTOSHOP
 - 8 WORKING CREATIVELY IN PHOTOSHOP
 - 9 TRANSFORM COLOR TO IR EFFECT IN PHOTOSHOP
 - 10 BE INSPIREDAppendix A RESOURCES
- [circa 2009 – bit out of date ...]*





Questions/discussion: DennisFreeman4510@msn.com