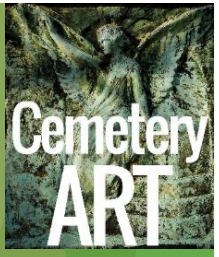


Introduction To Infrared Photography

By Bob Vishneski

February 27, 2024

“Vision is the art of seeing things invisible.”

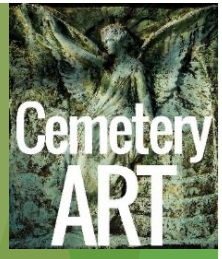
– Jonathan Swift

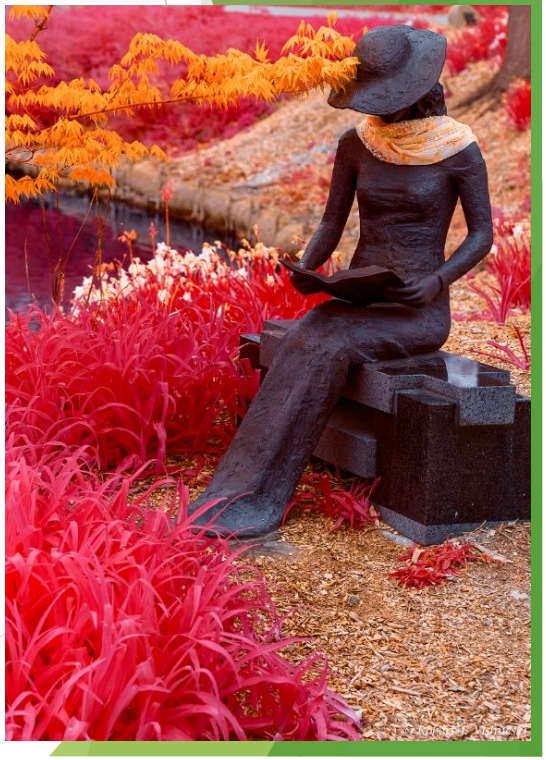
Agenda

- My background
- What is infrared light?
- History of infrared photography
- Digital infrared photography
- Infrared filter characteristics
- Post-Processing options & examples
- Workflow
- Summary
- Links
- Q&A

Not-so-hidden Agenda:

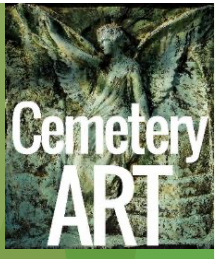
Recruit more people into the infrared ranks!

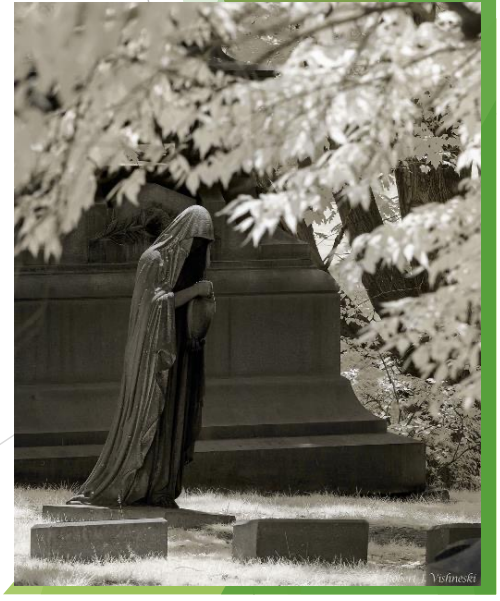




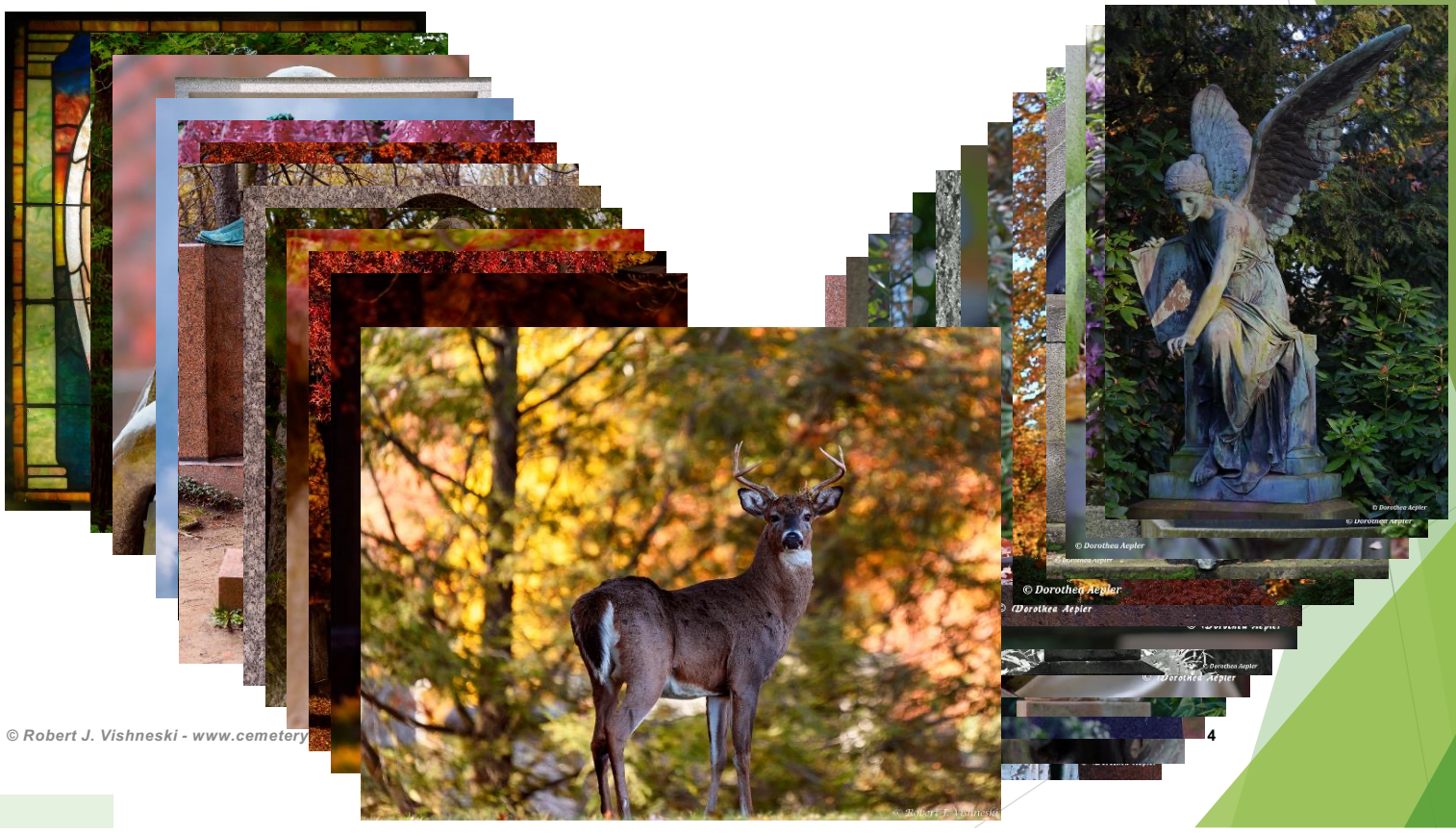
My Background

- Career in software development – consulting, management, marketing, & systems integration
- Last ~30 years in the media industry – enterprise software and analytics
- Resumed my photography passion in 2006
  - Olympus OM-1 and OM-2 – 1970s & 80s
  - First Digital DSLR - Pentax K10D
  - First digital infrared converted camera — Nikon D40X - 2007
  - Other Nikon Camera Conversions — D90, D7100, D7200, D750
  - Infrared filters — 550nm, 665nm, 720nm & 850nm
- Began writing for Mansurovs.com which became www.photographylife.com
- Now using a 550nm converted Sony A7IV from Kolari Vision





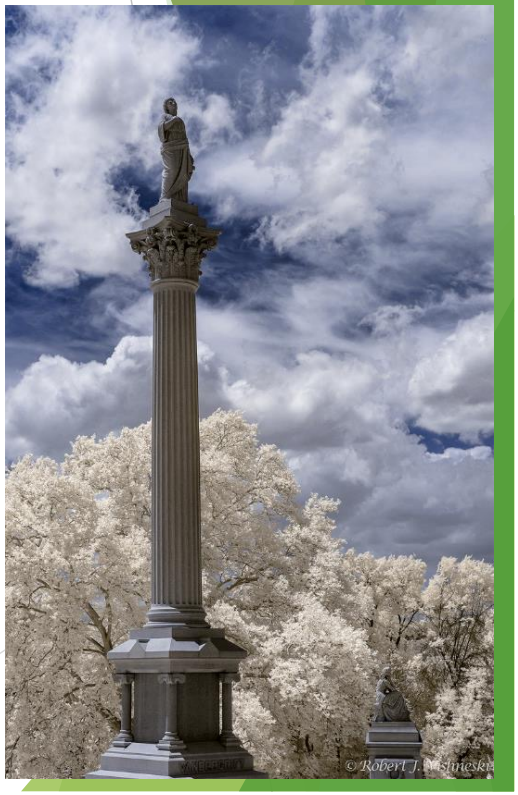
Started Cemetery Art in 2020 with Dea Aepler



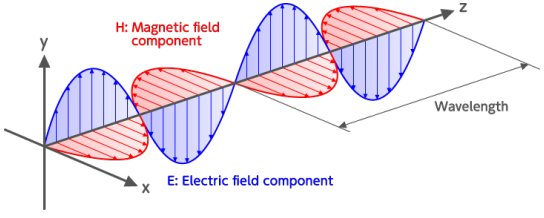
Infrared Light

"We don't see things as they are, we see them as we are."

— Anaïs Nin

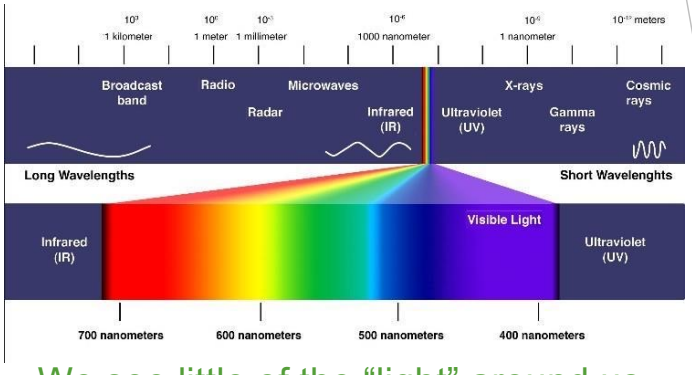


But first… A bit about Light…

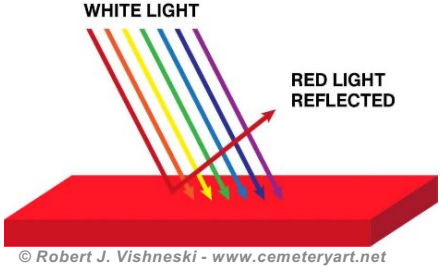


Light is a wave. And as Einstein proved… a particle.

Electromagnetic Radiation - EMR



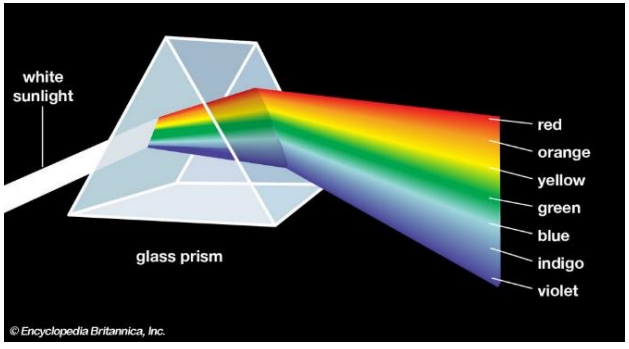
We see little of the "light" around us – *about 380-700nm*

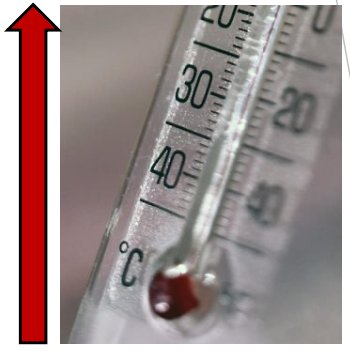


We only see reflections of the light not absorbed

Alek Komarnitsky
https://www.komar.org/faq/colorado-cataract-surgery-crystalens/

Infrared Light Discovery & Evolution





1800 — Astronomer Frederick William Herschel – *Beyond the boundary of visible light*

- Early 1900s - Professor Robert Woods noted the brightness of Vegetation on infrared sensitive plates - "The Woods' Effect"
- 1930s – Kodak Infrared Film
- 1940s - WWII – Reconnaissance Missions
  - Famous Aerochrome Film
  - Geography photography – cut through atmospheric haze
  - Vegetation vs. buildings painted green
- Crime Scenes

Infrared Photography - Near Infrared Light

- 750nm-1000nm (wavelength) – just beyond visible light (350-700nm)

- ***Not*** thermal images (far infrared light) ~ 15X longer wavelengths than near infrared light
- ***Not*** Ultraviolet light – 10nm-400nm

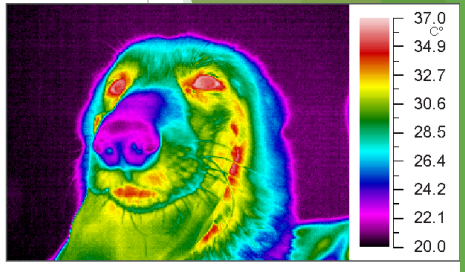


Figure 1

Sunscreen – In visible and ultraviolet light

Film, Art, Pop Culture & Documentaries

Infrared Photo of Bob Dylan, © Elliot Landy

Infrared Album Cover - Jimi Hendrix, ©Many, Wikimedia Commons

General Fevrier, North Kivu, eastern Democratic Republic of Congo, 2010

© Richard Mosse – Aerochrome Film

More on Richard Mosse's work
https://www.youtube.com/watch?v=BTVkqwuLYHU&t=130s
550nm Infrared Filter:
https://photographylife.com/reviews/kolari-vision-550nm-infrared-filter

Why Infrared?

"In the right light, at the right time, everything is extraordinary."

— Aaron Rose

- Allows us to see the world of the unseen — a light beyond our physical limitations
- Almost everything looks different in infrared light
  - Vegetation
  - Colors
  - Materials
  - Skin tones
- You can take photos under the worst lighting conditions — middle of sunny days in June, July, and August
- Provides some uniqueness in a world taking >1.6 trillion photos per year
- Engages your mind in different ways
  - You begin to see in infrared
  - "Why are you taking a picture of *'that'*?"

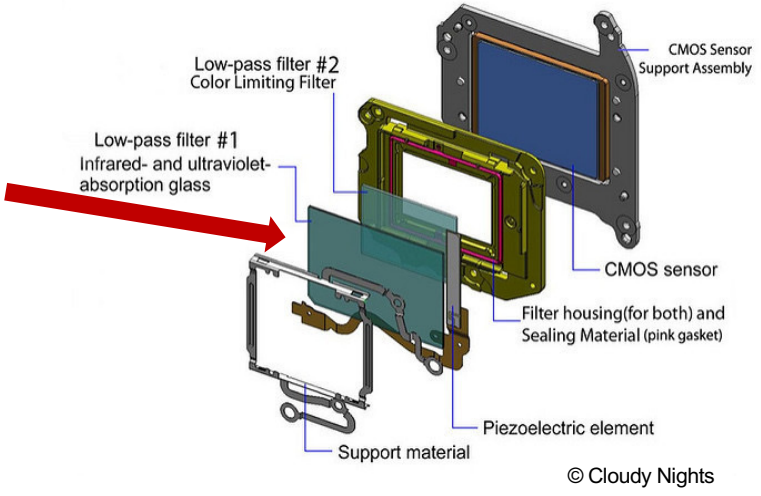
VINE-COVERED TREE IN INFRARED LIGHT, BELHURST CASTLE, GENEVA, NY

"Nice winter scene!"

"Walk on by…"

— Burt F. Bacharach / Hal David

Digital Infrared Photography



© Cloudy Nights

- + Manufacturers install infrared and ultraviolet light blocking filters
- - Conversion companies remove the IR blocking filter and install an IR (or UV) filter
- Voids camera warranty

I have converted 5 DSLRs and 1 Mirrorless camera since 2007

Not one issue with any camera's operations

External Filters *(on unconverted cameras)*

- Pros
  - Cheap
  - Easy
- Cons
  - Internal infrared blocking filter requires long exposure time
  - May take 45—90 seconds to get a proper exposure
  - Tripod a necessity
  - Not practical in many situations

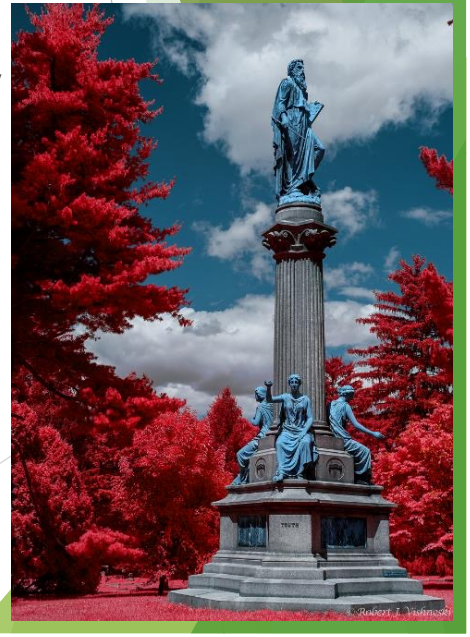
DSLRs

Hoodman Live View Kit

- Pros
  - Affordable
  - Plenty of lens options
- Cons
  - ***See image in visible light through Optical View Finder***
  - If you use an 720nm external filter on a converted 550nm DSLR, you will need to use LiveView (Nikon term)
  - ***Constant Live View usage can quickly deplete your battery***
  - Technology slowly being phased out as investments and adoption rates of mirrorless technology grows

Mirrorless

- Pros
  - ***EVF allows much more flexibility relative to conversion options and filters***
  - ***WYSIWYG — Can view IR image in the Electronic View Finder (EVF)***
  - Less moving parts so mean-time-to-failure should be better than DSLRs
  - Closer lens flange-to-sensor allows for less distortion and sharper images, especially toward edges
  - Wave of the future
  - Smaller & lighter, although not as much as originally hyped
- Cons
  - Were commanding a premium price, but coming down
  - Native mirrorless lens selections can be limited depending on brand
  - Battery life improving but still ~1/2 of DSLR technology

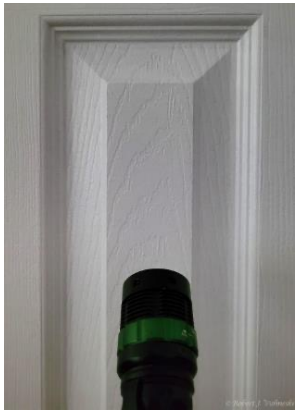


Infrared Light & Camera Sensors

- Unconverted DSLRs and Mirrorless cameras use internal filters to eliminate infrared and ultraviolet light
- IR Conversion process removes one or both of filters and insert an internal filter to allow a specific range of light to reach sensor
- Infrared & Ultraviolet light capture — a byproduct of sensor design, not the purpose
- Sensors not designed to meter using infrared light – You may need to adjust Exposure Compensation (+/-) in some conditions
- If you use multiple IR filters, select a white balance setting for your LCD that can work for multiple filters

Image from D750 LCD

Smartphones



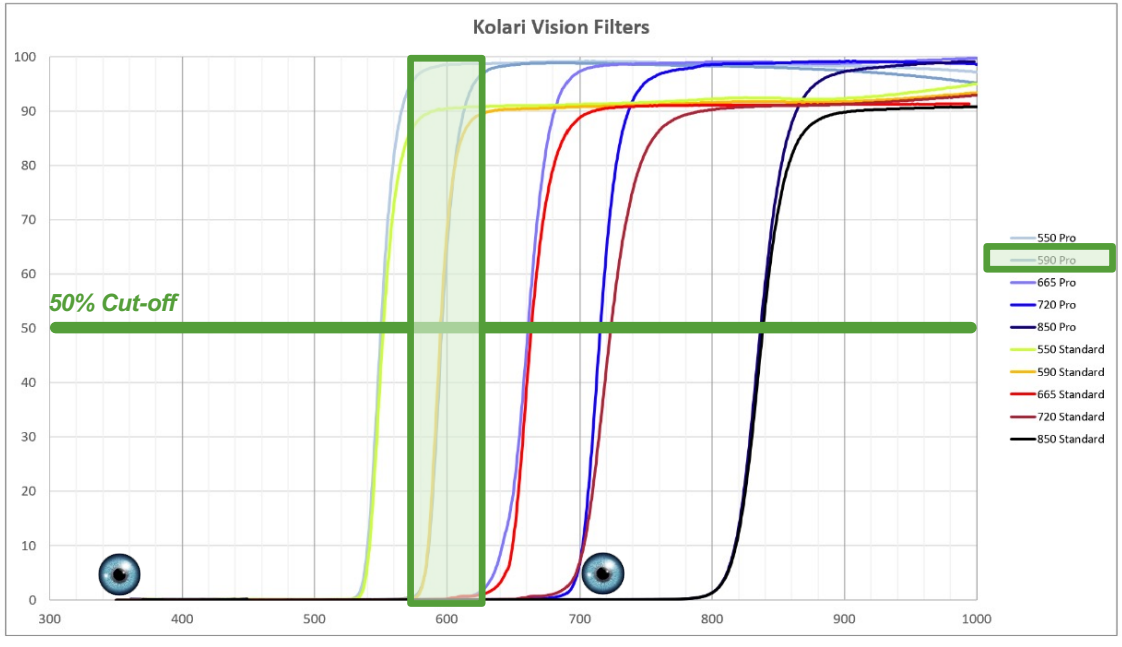
Infrared Flashlight – What I saw

Infrared Flashlight – What smartphone saw

Taken by holding infrared filter over smartphone lens

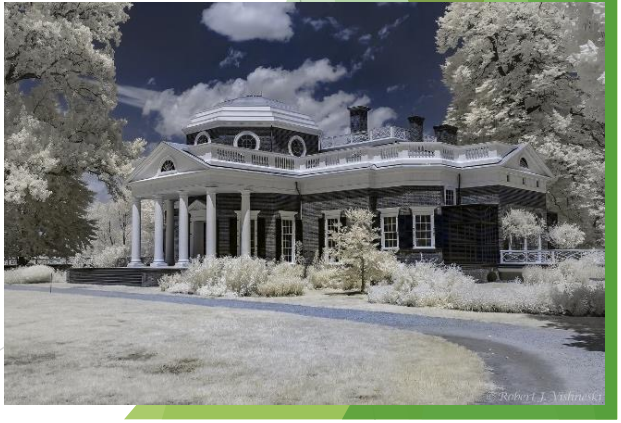
https://www.cemeteryart.net/getting-started-with-infrared-photography

Infrared Filters – Named by Cut-Off %



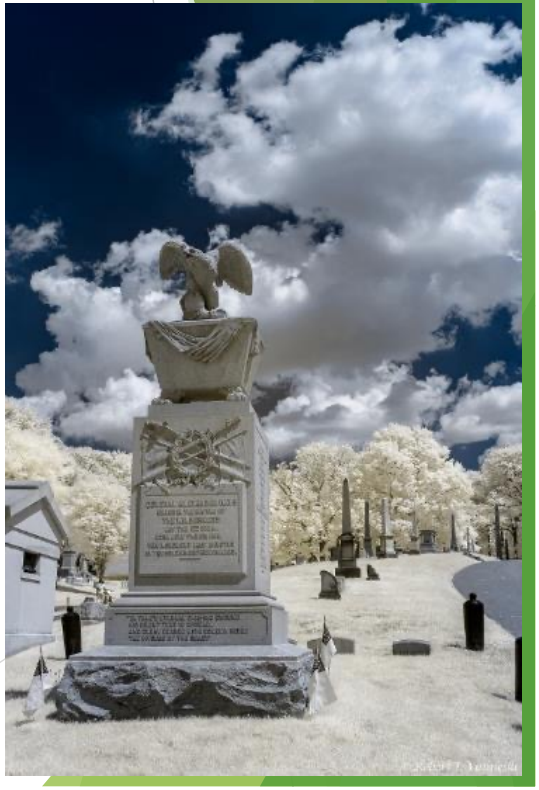
More Visible Light ⟵ ⟶ More Infrared Light

You can put higher nanometer wavelength filters over lower wavelength filters



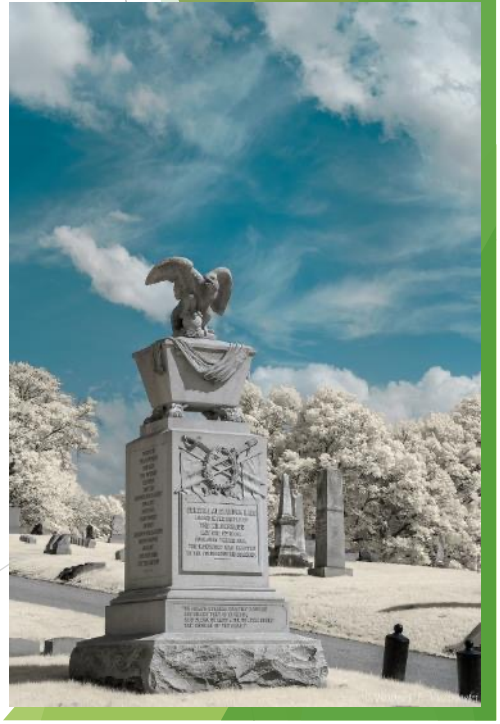
Infrared Light & Camera Sensors

- Filter choice – matter of taste and post-processing skills
- The higher the wavelength (nanometers — nm)
  - More infrared light and less visible light
  - 850nm filter – no visible light
  - Foliage will appear brighter and more white
  - Less “false colors” options
  - Higher the ISO required (sensors not designed for infrared light)
  - Lens hotspots (next slide) are more apparent
  - Can see through
    - Some sheer fabrics *(yes – this means some clothing!)*
    - Sunglasses



Infrared Light & Camera Sensors

- The lower the wavelength (nanometers — nm)
  - Less infrared light and more visible light
  - Less opportunities to replicate vegetation's bright white "pop"
  - Foliage appears more colorful
  - Lower the ISO required (sensors designed for visible light)
  - Fewer problems with lens hotspots



Infrared Challenges

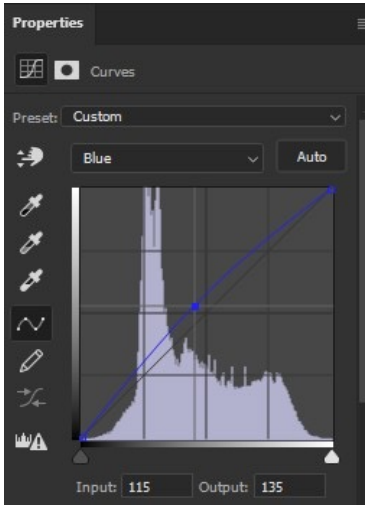
- Camera's Metering system
  - Designed for visible light
  - Can sometimes be fooled by infrared light
  - Need to monitor and adjust Exposure Compensation if you encounter issues (+/-)
- Lens Hotspots
  - Some lenses have internal barrel coatings that play havoc with infrared light
  - Produce slight-to-moderate overexposure and lack of contrast in the center of the image
  - May be consistent or a function of focal length and aperture
  - Many zoom lenses will produce various degrees of hotspots at the lower end of the focal range
  - Conversion companies such as Kolari Vision and Lifepixel have lens databases with rankings for infrared photography

Fixing A Hotspot

"It is a common experience that a problem difficult at night is resolved in the morning after the committee of sleep has worked on it."

— John Steinbeck

Hot Spot



Curves Adjustment Layer

Mask, Reveal & Adjust

Final Result

Infrared Challenges

- Infrared flairs
  - We can see visible light flare but not infrared flare
  - Check camera to ensure you are not getting infrared flares in your images
  - Putting your hand or hat between the sun and your lens can help eliminate it
- Post-Processing
  - Has proven maddening for many and a reason why some give up
  - Over the years, I've received hundreds of emails asking for help
  - Takes time to master
  - Many-to-many relationships
  - Small changes can have big impacts
  - It is a bit of art and science
  - Being obsessive helps!

Processing
The Art of the Possible

“The only way of discovering the limits of the possible is to venture a little way past them into the impossible.”

— Arthur C. Clarke

Photoshop's Channel Mixer – *Critical in Infrared Processing*

- Most visible light photographers rarely, if ever, use it
- Controls the Red, Green & Blue channels of color in image – Like a translation service – "Color X translates into Color Y"
- One visible light example – Film LUTs (look-up tables) – achieve styles/looks for photos and film

The Aviator
Cate Blanchett
& Leonardo DiCaprio

As Katharine Hepburn and Howard Hughes




Cemetery ART

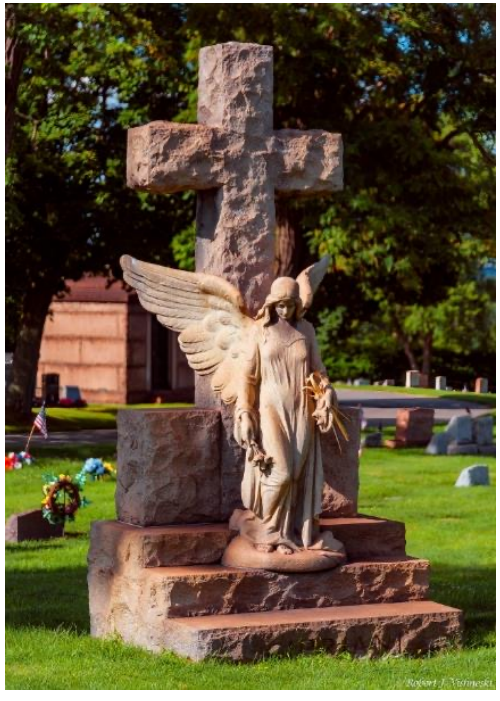



Visibile & Infrared Light

“We do not need more of the things that are seen, we need more of the things that are unseen."

— Calvin Coolidge

Visible Light



Classic 720nm

Popular 550nm Look

Examples – Black & White

"When you photograph people in color, you photograph their clothes. But when you photograph people in black and white, you photograph their souls!"

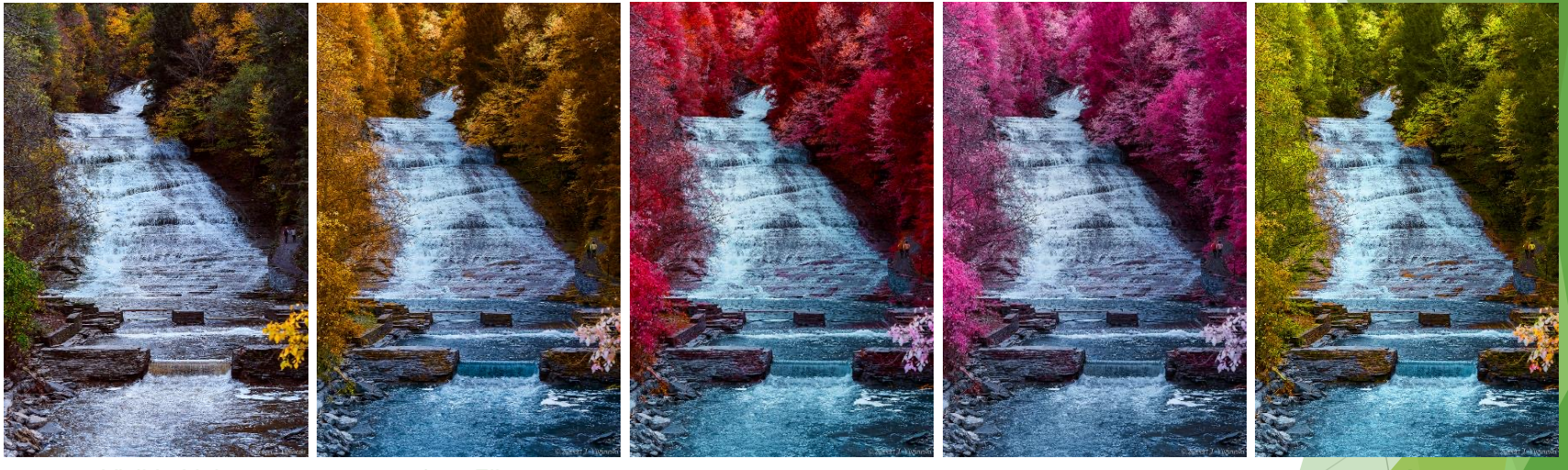
— Ted Grant

Visible Light

Classic 720nm

Popular 550nm Look

550nm Variations – Buttermilk Falls, NY

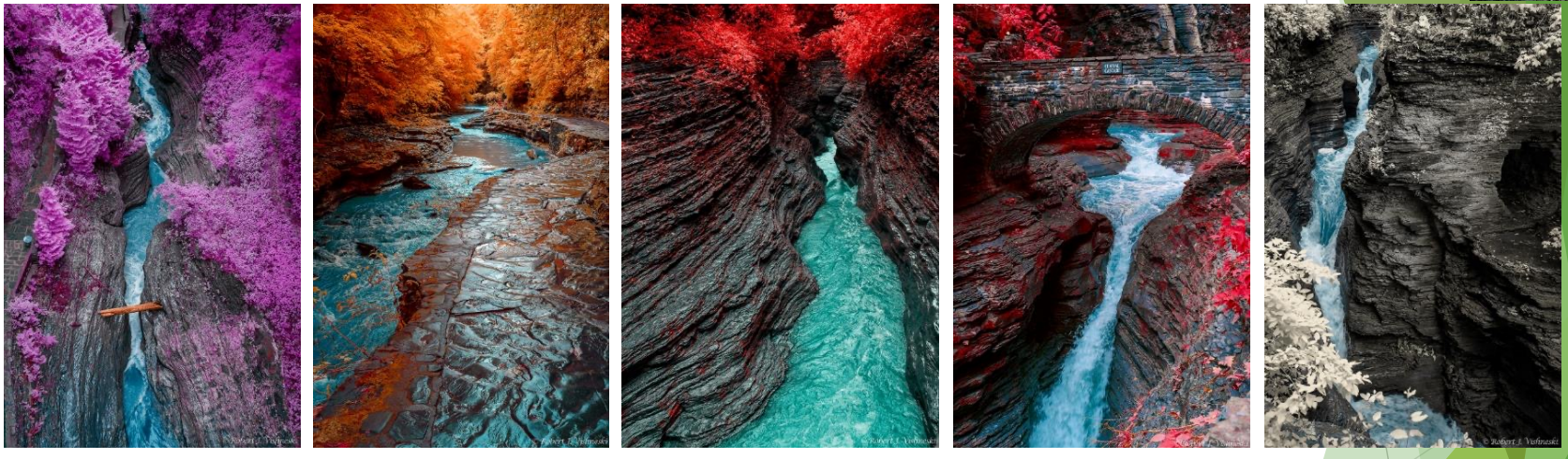


Visible Light *550nm Filters* ----------→

"Your choices determine the colors of your world."

— Daniel Jackson

More 550nm Variations – Watkins Glen Gorge, NY

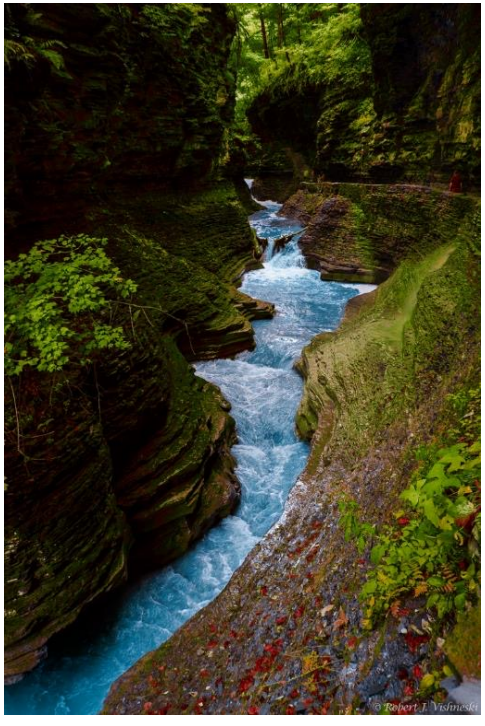


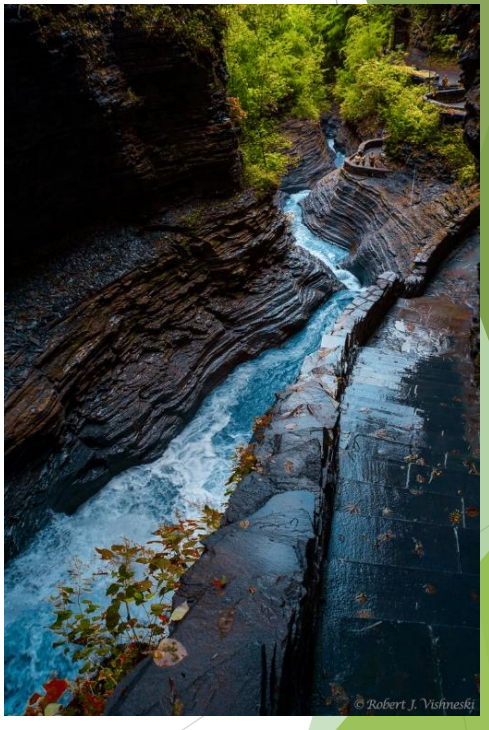
The 450nm-590nm range of filters offer a wide variety of post-processing color options

"All the variety, all the charm, all the beauty of life is made up of light and shadow."

— Leo Tolstoy

550nm Variations – Faux Visible Light





"All that we see or seem is but a dream within a dream.
— Edgar Allen Poe

Workflow

(covered in workshop)

Adobe Camera RAW

Adobe Lightroom

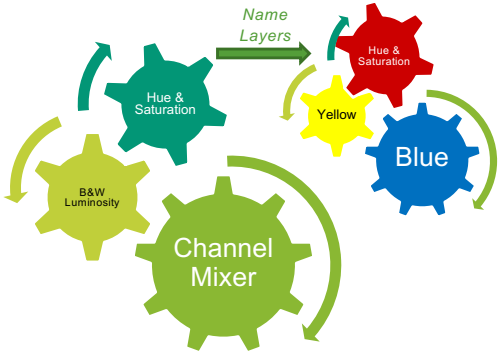
Native Nikon, Canon, Sony, etc. Application

Library of Presets

Adobe Photoshop

***RAW** or JPG*

Get It Right In Camera

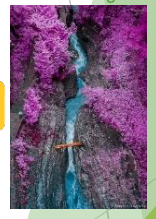


Save Settings Into Folders

"Reference Images"

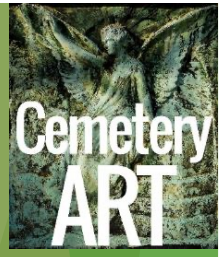
Base Image

Final Image



Drag & Drop Onto New Images

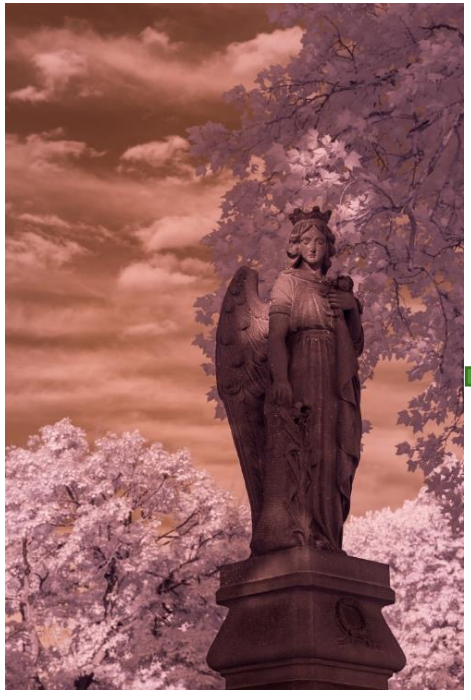
RAW → Exposure → Pre-Processing → Presets → Develop & Save Settings → Reuse & Adjust



Post-Processing – 720nm

"If I had an hour to solve a problem I'd spend 55 minutes thinking about the problem and 5 minutes thinking about solutions."

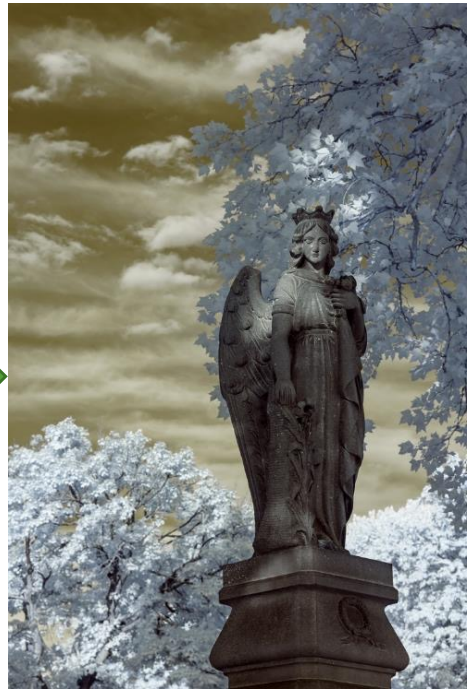
— Albert Einstein



WB – 2000, Tint – 72 (Lightroom)

Adobe DNG Color Profile Editor – Camera Profile Created

After



WB – 9750, Tint – -8

Final

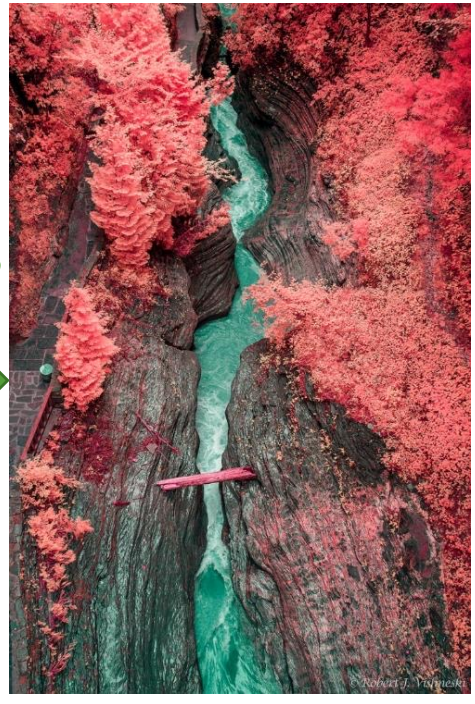
Post-Processing – 550nm

"Set your sights beyond what you can see. There is true majesty in the concept of an unseen power which can neither be measured nor weighed."

— Ted Koppel

Base

Using Standard 720nm Infrared Channel Swap Method
Red-to-Blue
Blue-to-Red



After Channel Swap

Final Image – *Log Touch-up*

Post-Processing – 550nm

“Creativity is intelligence having fun.”

— Albert Einstein

Summary

- Infrared light offers an opportunity to explore a unique aspect of photography
- Allows you to capture the world as most people never experience it
- Many more infrared resources available than in years past
  - Conversion companies
  - Websites & social media
  - Lens hotspot databases
  - Photoshop actions
  - Video tutorials
- There's an infrared solution for every budget
- In time… you may begin to see the visible world in infrared light
- And you never know where the road will lead

Links

- Kolari Vision - https://kolarivision.com/
- Life Pixel – https://www.lifepixel.com/
- CLiR - https://f64elite.com/ir-mastery/
- MaxMax - https://maxmax.com/
- Cemetery Art - https://www.cemeteryart.net/
- Photography Life - https://www.photographylife.com/

Q&A

“It doesn't pay to get discouraged. Keeping busy and making optimism a way of life can restore your faith in yourself.”

— Lucille Ball