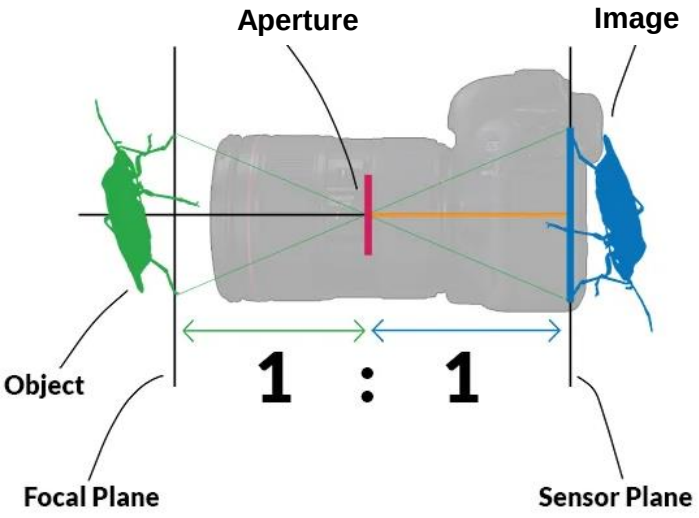
Macro Photography

March 16, 2023

By Dennis Freeman with
David Blass
Dave Powell
Pete Morton

Close-up & Macro



- Macro-Photography
  - Photographing something at a magnification that renders it life size (1X or 1:1) on a camera's sensor.
  - Lens equipment that can render ≥ 0.25X is frequently called "macro" or implied with

- Close-up Photography
  - Where the subject or an area of a subject is taken from a closer than normal point of view, e.g. a detail.
  - > 0.1X & < 0.5X

Magnifications

1.4X

1X (life size)

0.5X

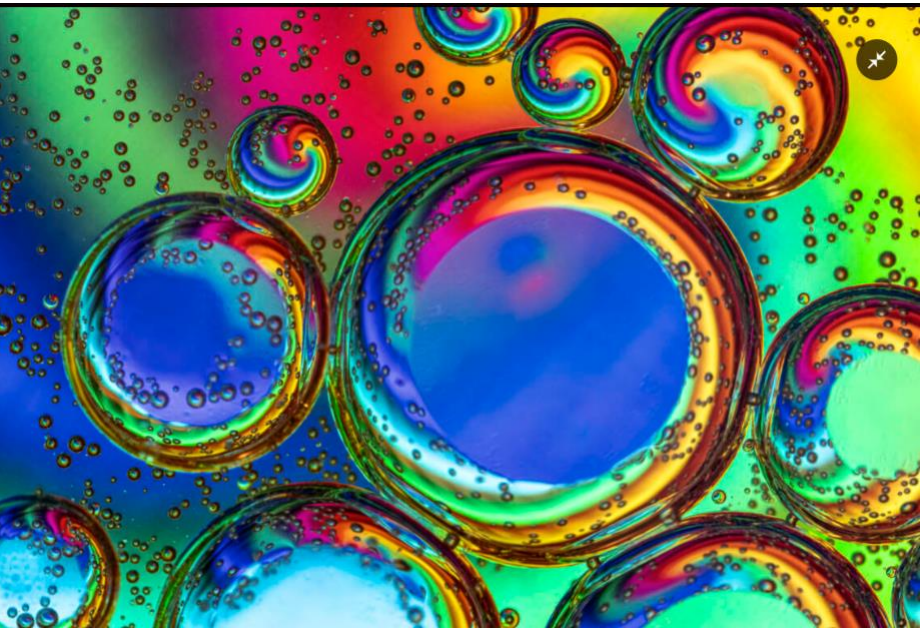
0.25X

Spencer Cox: 105mm f/2.8, ISO 800, 1/250 s, f/22.0

Jenny Rainbow - Orchid

March 25 Field Trip!

Alberto Panizza: 105mm f/2.8, ISO 64, 1/3 s, f/7.1

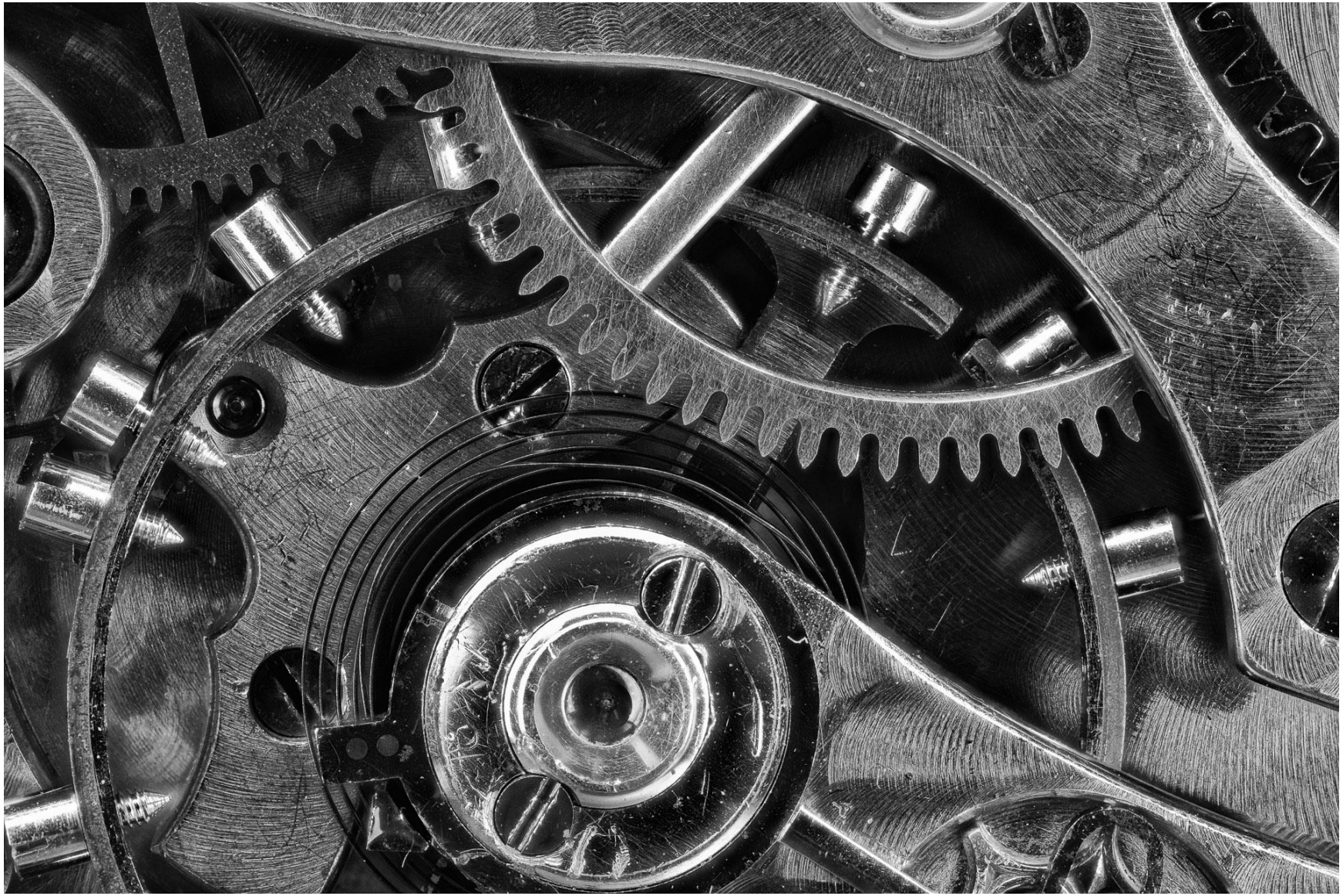


Spencer Cox: 105mm f/2.8, ISO 100, 1/10 s, f/5.6

David Blass - #1

David Blass - #2

David Blass - #3



Pete Morton

Kenilworth Aquatic Gardens, 2021.

- Canon R5; 24-240mm lens @ 240mm; 1/1000 sec; f/6.3; ISO 200; handheld. Near closest focusing distance of 30” (0.26X)
- Cropped. Used the Lightroom/Camera Raw masking capabilities to darken the background, slightly reduce the brightness of the white petals and add a bit of texture. Finally, noise and sharpening were handled with Topaz filters.

Multiple Ways to do Close-up and Macro Photography

- True “Macro” Lens (~1X)
- “Close Up lens” (also called Close Up filters) - characterized by their diopter power
- Set of Extension Tubes
- Teleconverter
- Zooms or Telephoto Lenses (look for 0.25X to 0.5X) for Close Up Photography
- Smart Phone Cameras with a Macro feature

Macro Lens

Specialized lenses designed to be used at closer distances to photograph small objects. They are usually prime lenses (e.g. 100mm, 90mm, 30mm …) with a large and constant aperture (e.g. f/2.8)

Canon EF 100mm f/2.8 macro

Nikon 105mm f/2.8G VR macro

Pros

- Magnification ratios ~ 1:1
- High quality images (bokeh, colors, contrast)
- High performance autofocus
- Telephoto & portraiture uses too

Cons

- Price (check Used & eBay!)

Macro Lenses: Focal Lengths

- Macro Lenses usually come in slightly-longer-than-normal to medium telephoto in length
- Including these full-frame focal lengths:
  - 40mm
  - 60mm

  Compact size and easy to use. Good walkaround macro lens. Gets close to subjects.
  - 90mm
  - 100mm
  - 105mm

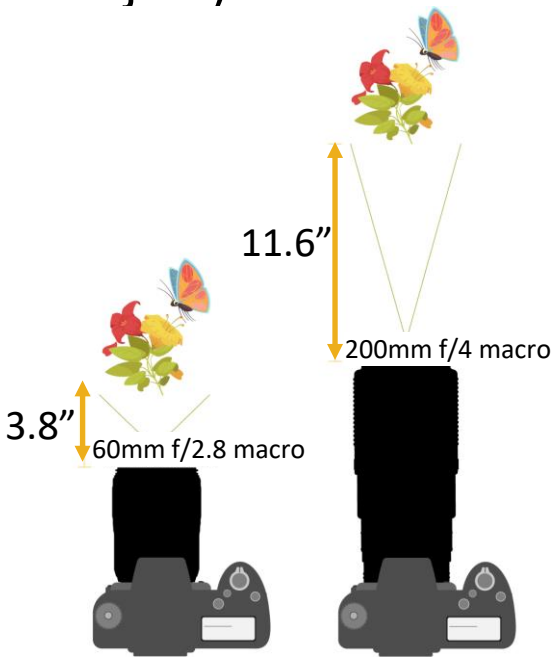
  Great balance of working distance* and performance without making the lens itself unwieldy.
  - 150mm

  Larger lens is more difficult to handhold but provides longer working distances

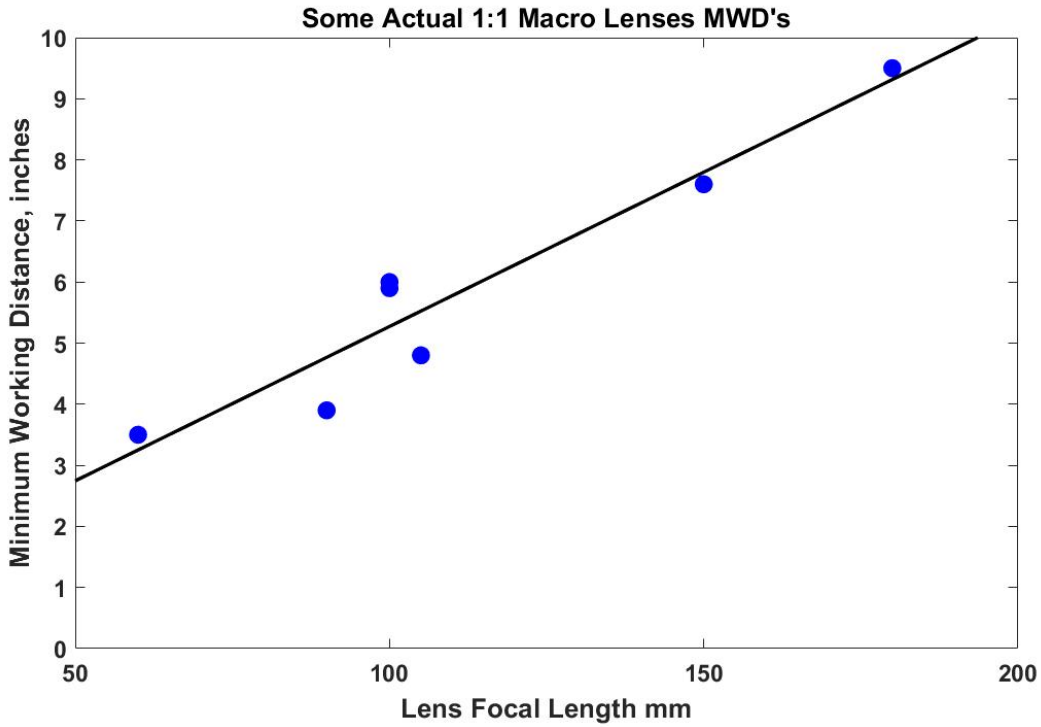
** Working Distance: minimum distance from front of lens to subject.*

Benefits of Longer Focal Length

- The longer the focal length, the greater your working distance (lens to subject)



Minimum Working Distance



- Advantages of greater working distances…
  - Staying out of shrubbery
  - Not scaring skittish subjects

- Can add a teleconverter to some macro lenses to gain added working distance.

Another Option: Extension Tubes

Can stack them for greater effect

Added Magnification = Extension tube's length divided by the focal length of a lens.

A 25 mm extension tube combined with a 50 mm lens adds 0.5X to the lens' magnification.

- OEM Extension Tubes
- 3rd Party Autofocusing Extension Tubes
- 3rd Party non-AF Extension Tubes

<u>Pros</u>

- Easy to use – any lens
- Shortens the Min. Focal Distance
- No added glass
- Affordable
- Lightweight / Compact

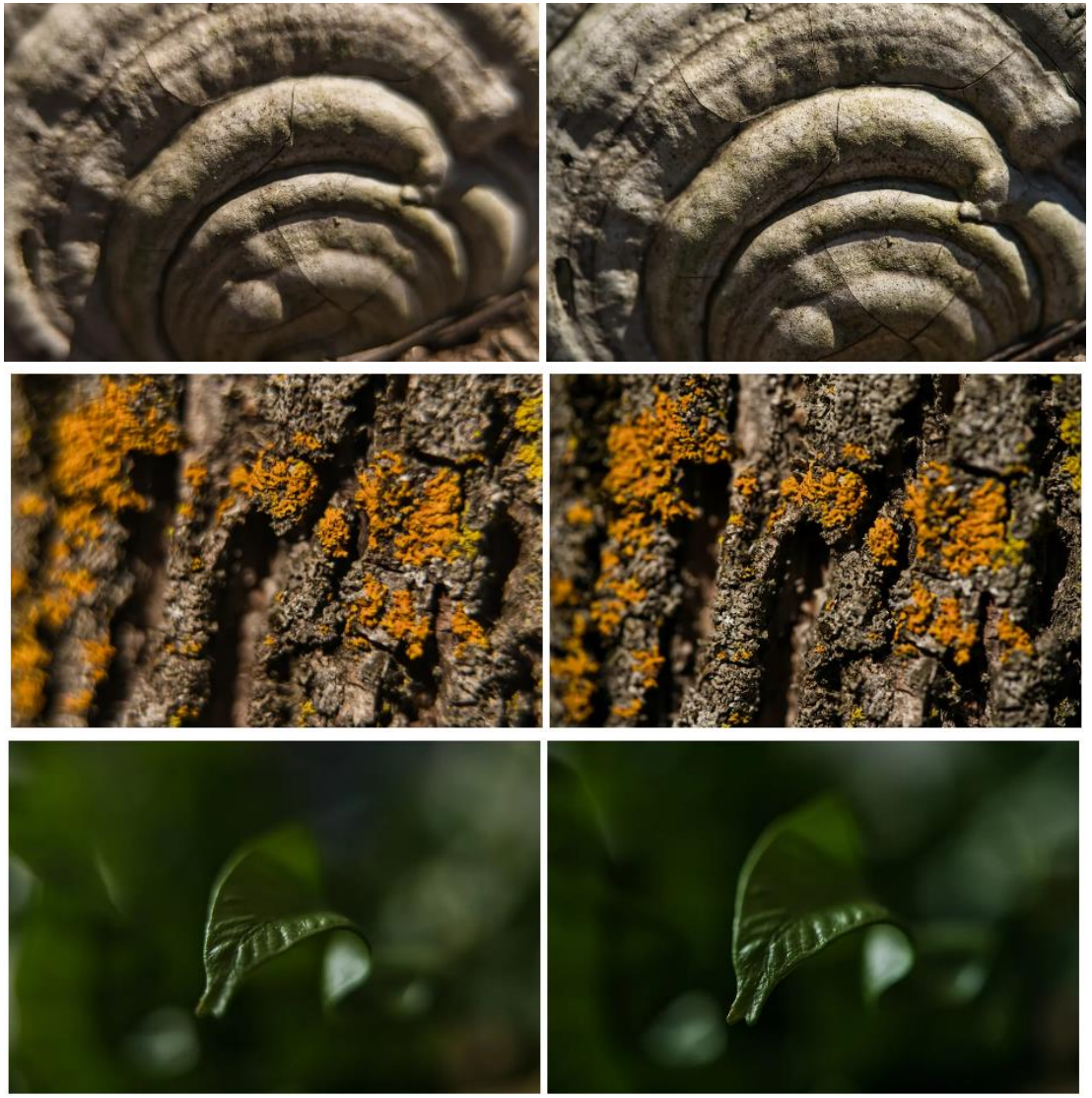
<u>Cons</u>

- Loss of brightness
- Narrow depth of field
- Provides only a minimal magnification gain with telephoto lenses.

Extension Tubes vs Macro Lens

Promaster Extension Tubes
on Sony 55mm f/1.8

Sony FE 90mm f/2.8 Macro



~$100 with your existing lenses

$100's for a new lens

Extension Tube Example:
0.28x lens + 21/74.3x tube = 0.56x

Thomas Stirr - 30-110mm crop sensor @ 74.3mm, ISO 800, 1/160, f/8.0, 21mm extension tube

Another Option: Close Up Lens (filter)

Achromatic (2 element) close up filters are better quality than single element.

Diopter Power: +1 +2 +4 +10

Pros

- Easy to use. Thread or slide onto lens
- Can stack them (e.g. 2d + 4d = 6d)
- Affordable
- Very Lightweight / Compact

Cons

- Added glass means reduced image quality
- Not sharp edge-to-edge
- Decreases Depth of Field

Close Up Filter Examples

By Jo Plumridge w/ Close Up Filter

By Joni Neimela w/ Close Up Filter

Lastly, Teleconverters

1.4X or 2.0X: converts an e.g. 100mm lens to a 140mm or 200mm lens.

Pros

- Easy to use.
- Can also be stacked with extension tubes
- No loss of Depth of Field
- Longer Working Distance
- Versatile
- Lightweight / Compact

Cons

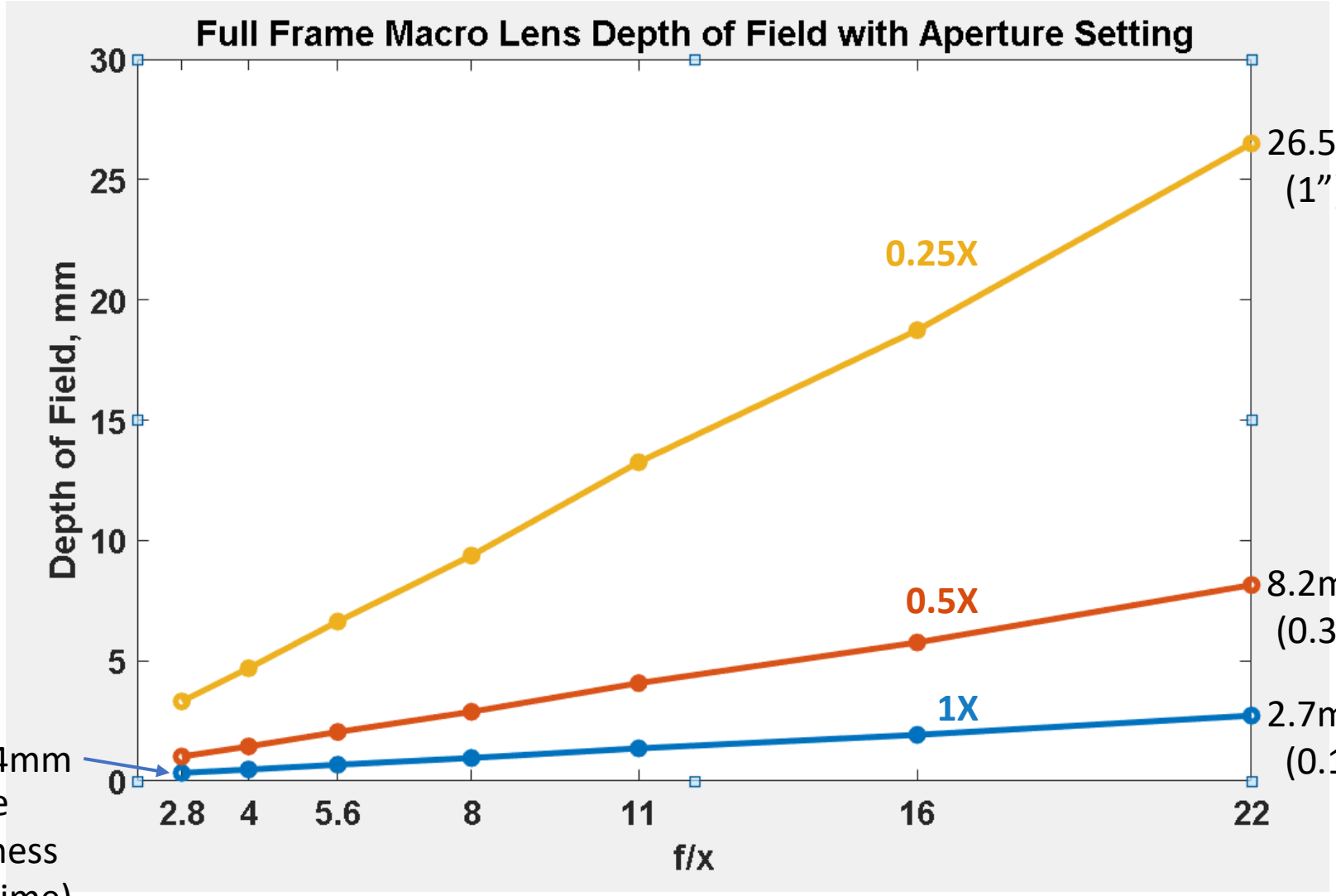
- Kind of expensive
- Added glass means reduced image quality
- Light loss (1.4X = 1 stop, 2X = 2 stops)
- Don’t use with ≤ 50mm focal length lenses
- Check on other compatibility issues.

Focus

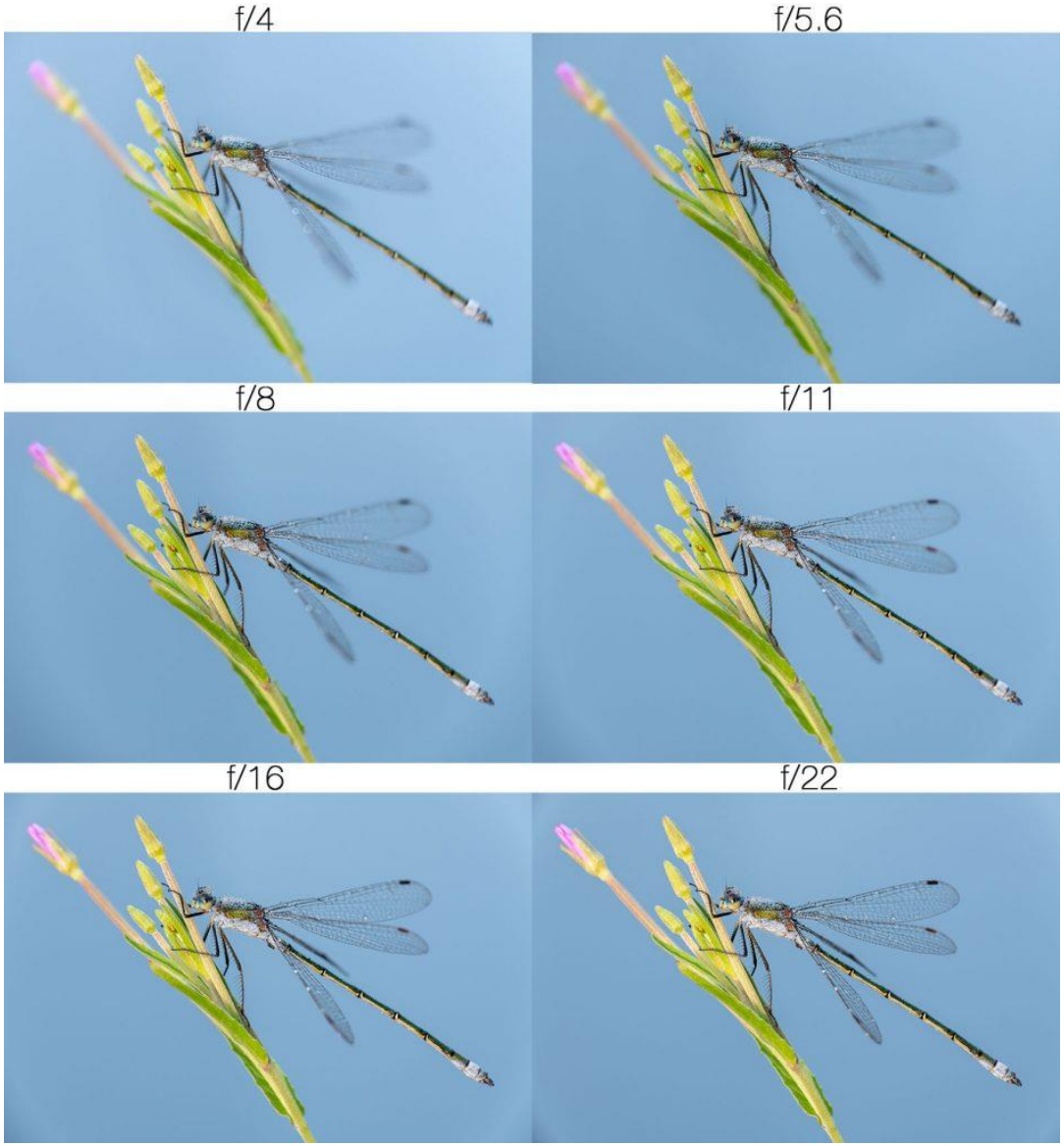
Depth of Field Issues

- “The closer the Focal Distance (camera-to-subject distance) the shallower the depth of field.”
- “The greater the magnification, the shallower the depth of field”.
- Macro photographs are focused very close with a lot of magnification and therefore have extremely shallow depth of field.
- Embrace it!

Macro DOF Decreases w/ Aperture Size & Magnification



Stop Down the Aperture to Sharpen More of the Image



Focusing Issues in Macro

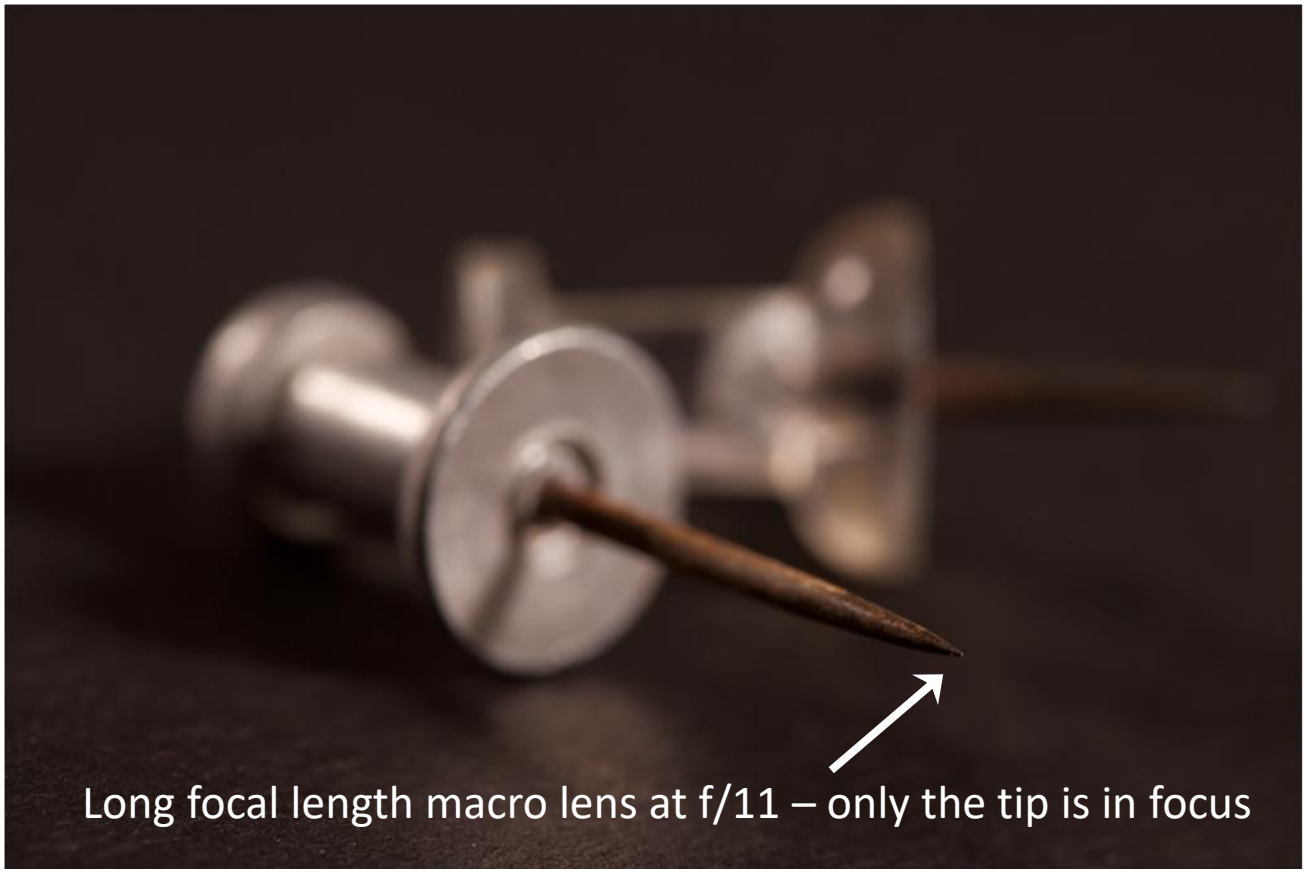
- Very shallow depth of field, millimeters. Means that camera shake or motion or subject motion in fractions of mm's will blur your image.
- Tripods are good. Remote shutter release is good.
- Handheld macro tips
  - Single-point, continuous autofocus, to get in the ballpark, and tiny back and forth camera movements to nail the final focus
  - Support the camera – brace yourself
  - Stop down the aperture (f/14, f/16, f/22)
  - Fast shutter speed and bursts of continuous shooting.
  - Bring light (flash, etc) to freeze motion & gain brightness
  - Tons of shots

Focus Stacking

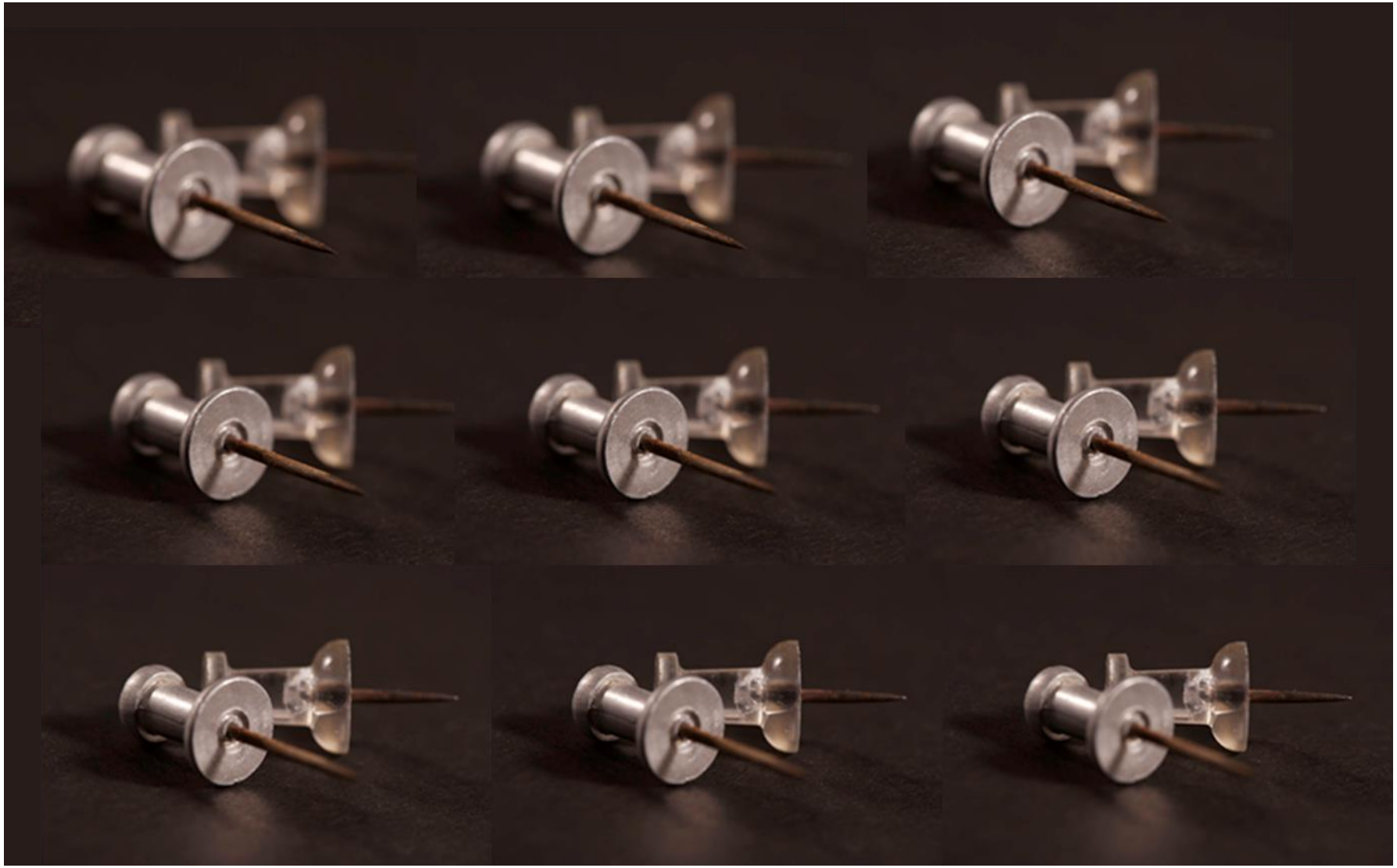
Getting everything that you want in focus

Depth of Field Issues

- An example subject of small size and scale… a pair of push pins.

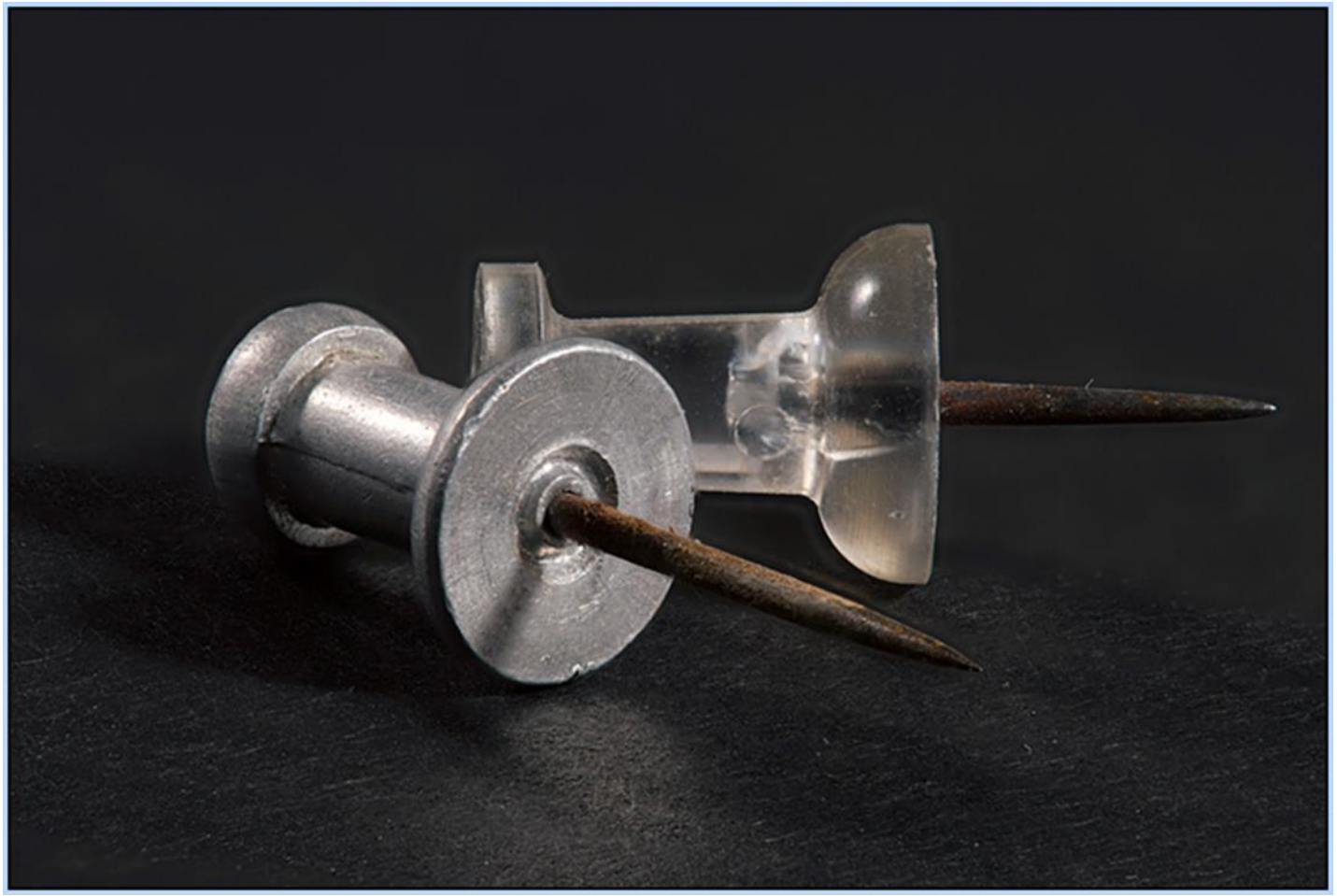


9 Sequential Images, Progressively Moving Focus from Front to Back



Focus Stacked with Helicon Focus

Final Image



Focus Stacking Software

photoworkout.com/best-focus-stacking-software

- Adobe Photoshop: Ps + Lr & 1TB cloud storage $20/mo.

- ON1 Photo RAW: $80 fixed price

- Helicon Focus

	Lite	Pro	Premium
1 year license	$30	$55	$65
lifetime license	$115	$200	$240

- Zerene Stacker: $89 fixed price

Useful Equipment for Close-up/Macro

- **Tripod:** Can want small apertures to increase the shallow depth of field. May want a slow shutter speed possible with a tripod.
- **Remote trigger or release:** To avoid touching camera – small movements are magnified. Can use a 2 second shutter delay instead.
- **Flash or other light source:** especially with insects or motion in breezes using small apertures and faster shutter speeds. Diffusers to soften shadows.
- **Macro Tripod Rail:** Gives the ability to move the camera and lens, back and forth, by turning a screw in very small increments. Allows for more precise focus, image or focus stacking, and less frustration.

Macro Rail

1 mm index marks. One full revolution is 1.25mm of travel.

For my Canon 100mm f/2.8 macro lens at f/16 and closest focusing distance (400 mm) my DOF is only 1.9 mm. I need ~1.5 mm steps over multiple shots to increase the DOF.

I'd need 9 shots to get 0.5" (12.7 mm) of sharp subject depth.

photopills.com/calculators/dof-macro

Macro Lighting

On-camera flash & diffuser

On-lens twin light flash

Flash bracket & remote flash

Silver/Gold Reflector & Plamp

Some Examples and Thoughts from Dave Powell

Questions?

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