The Art of Successful Focus Stacking

Rik Littlefield -- “The Zerene Stacker Guy”

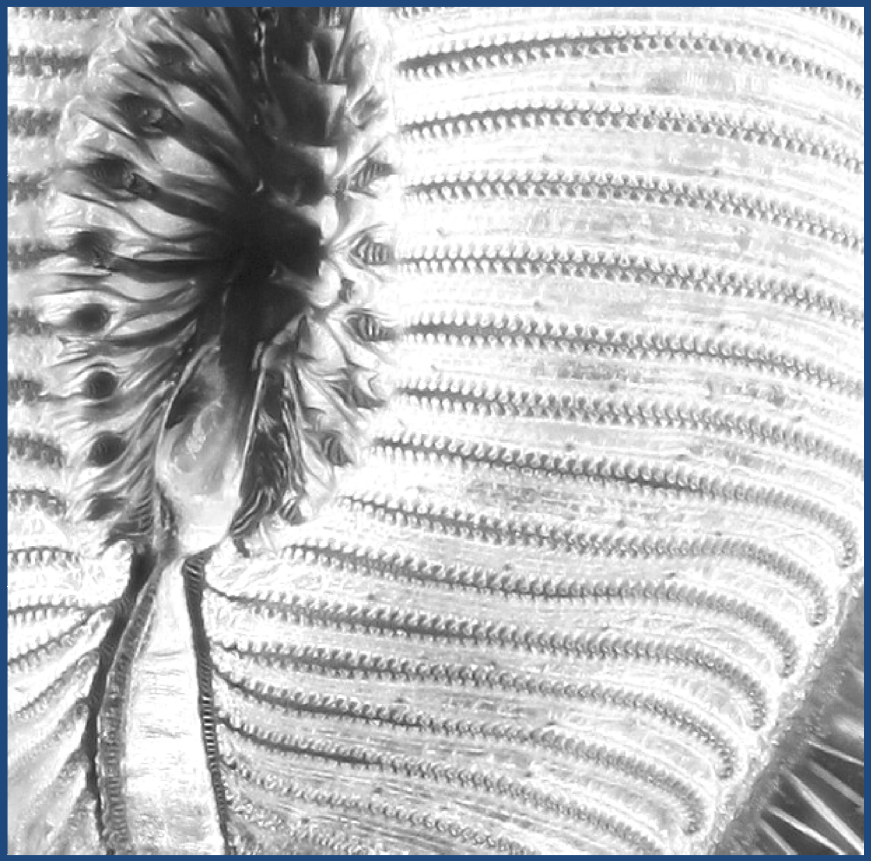
Email: support@zerenestacker.com

Forum: http://photomacrography.net

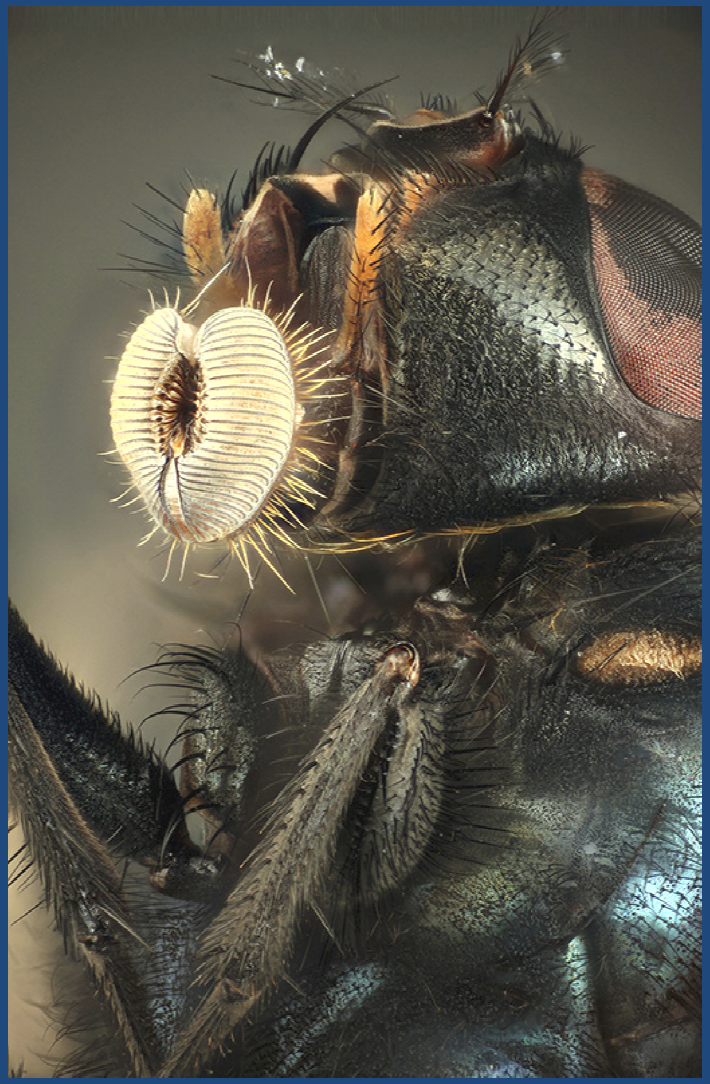
ICE 2016 -- International Congress of Entomology Orlando, FL September 29, 2016

SEM Is Wonderful !

1 micron resolution,
3.75 mm depth of field



But This Is Optical !



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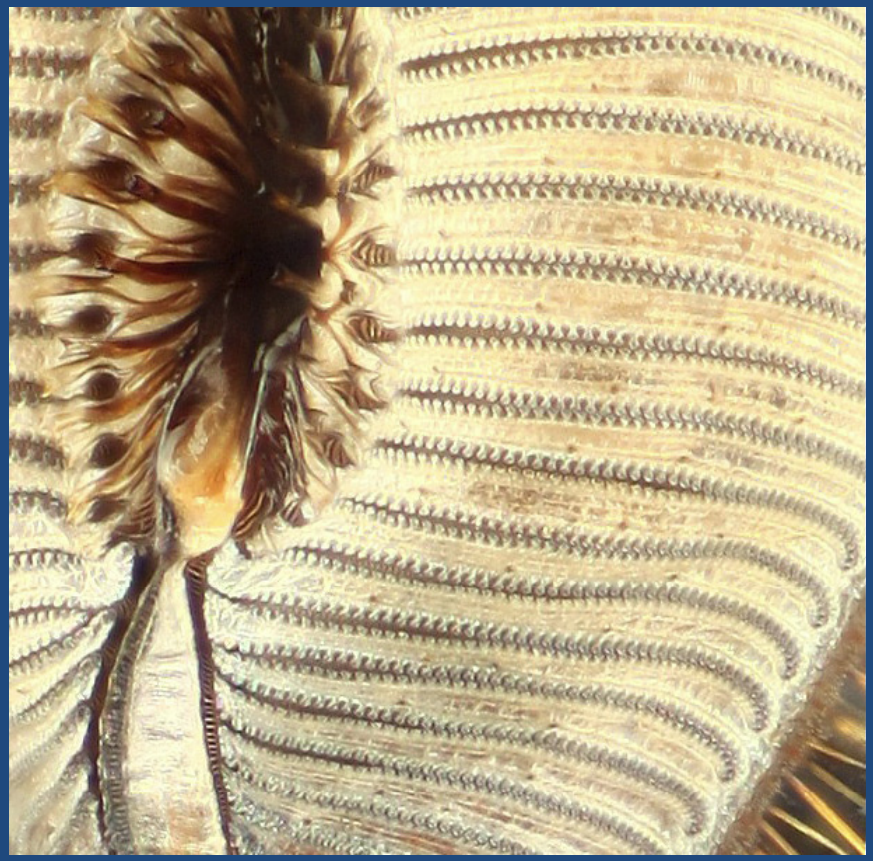
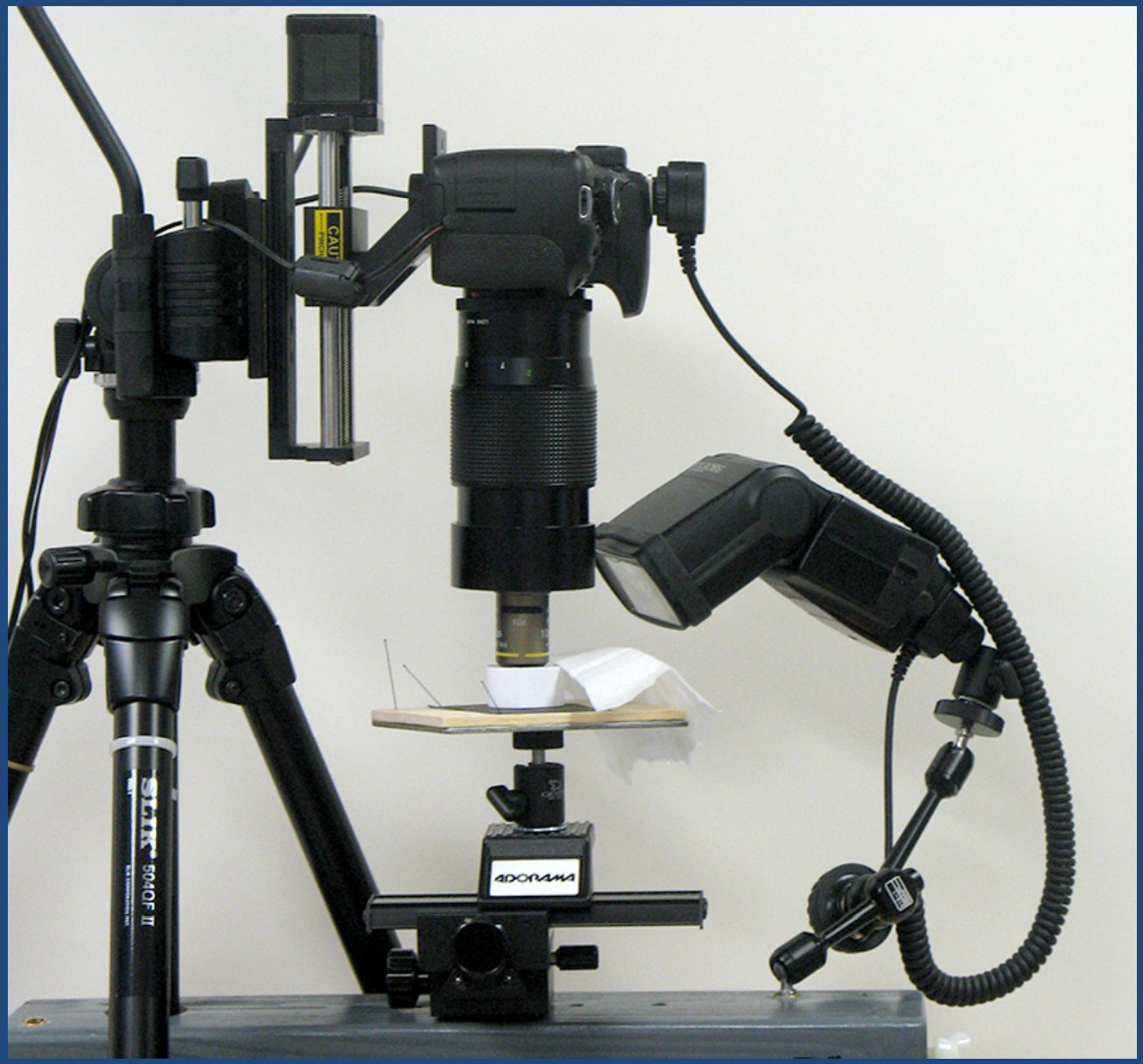


Here's the Setup



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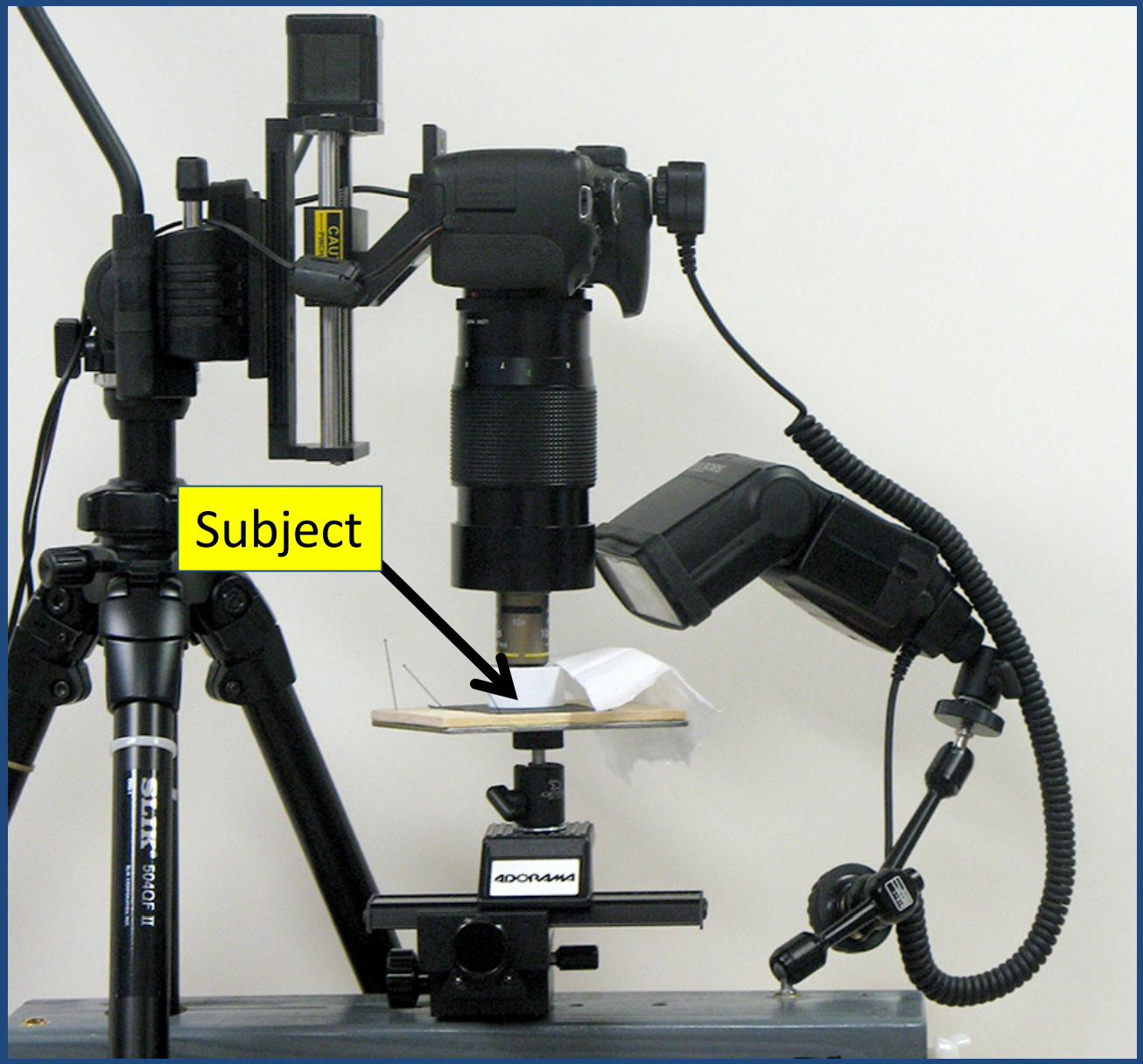

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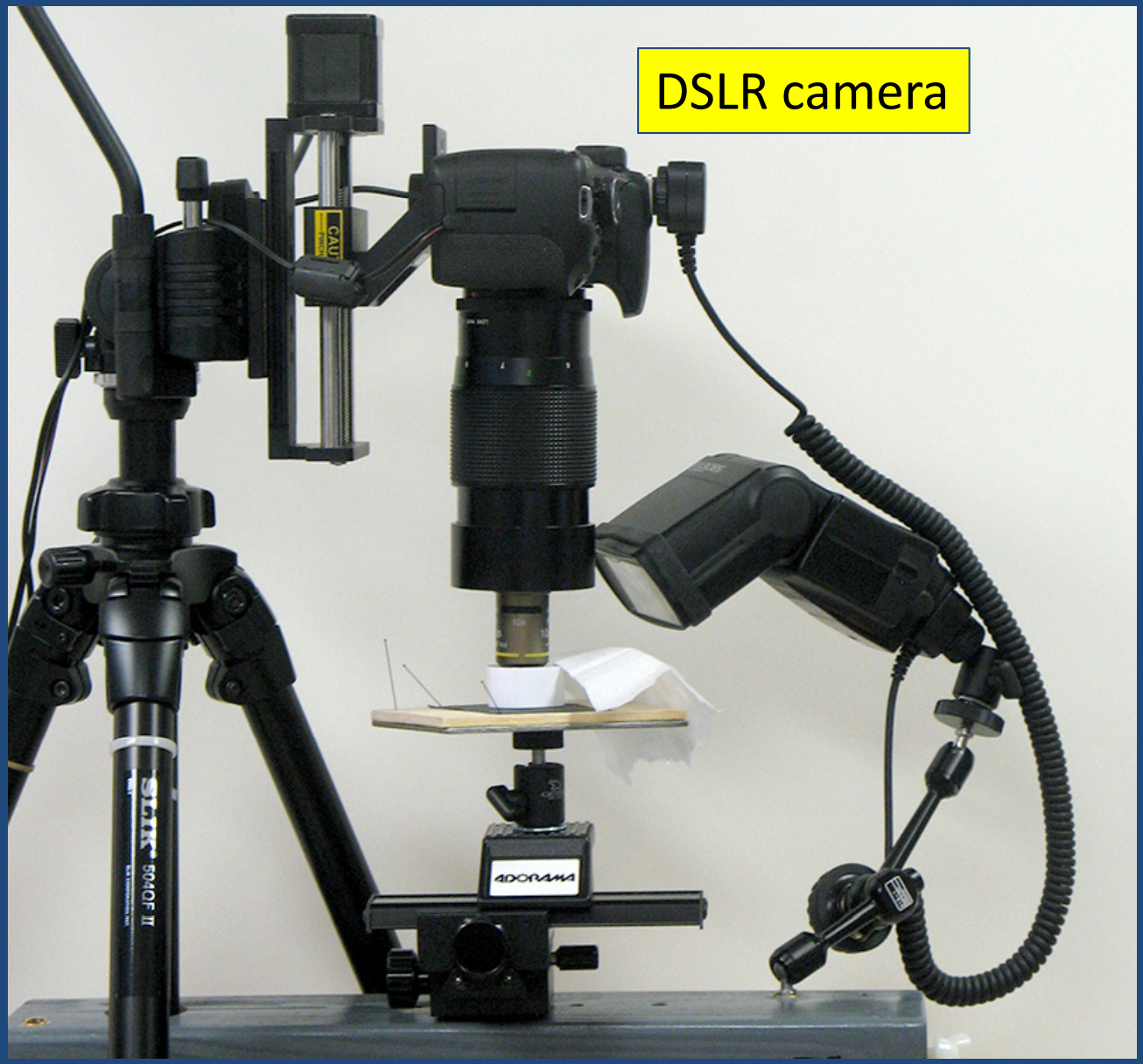

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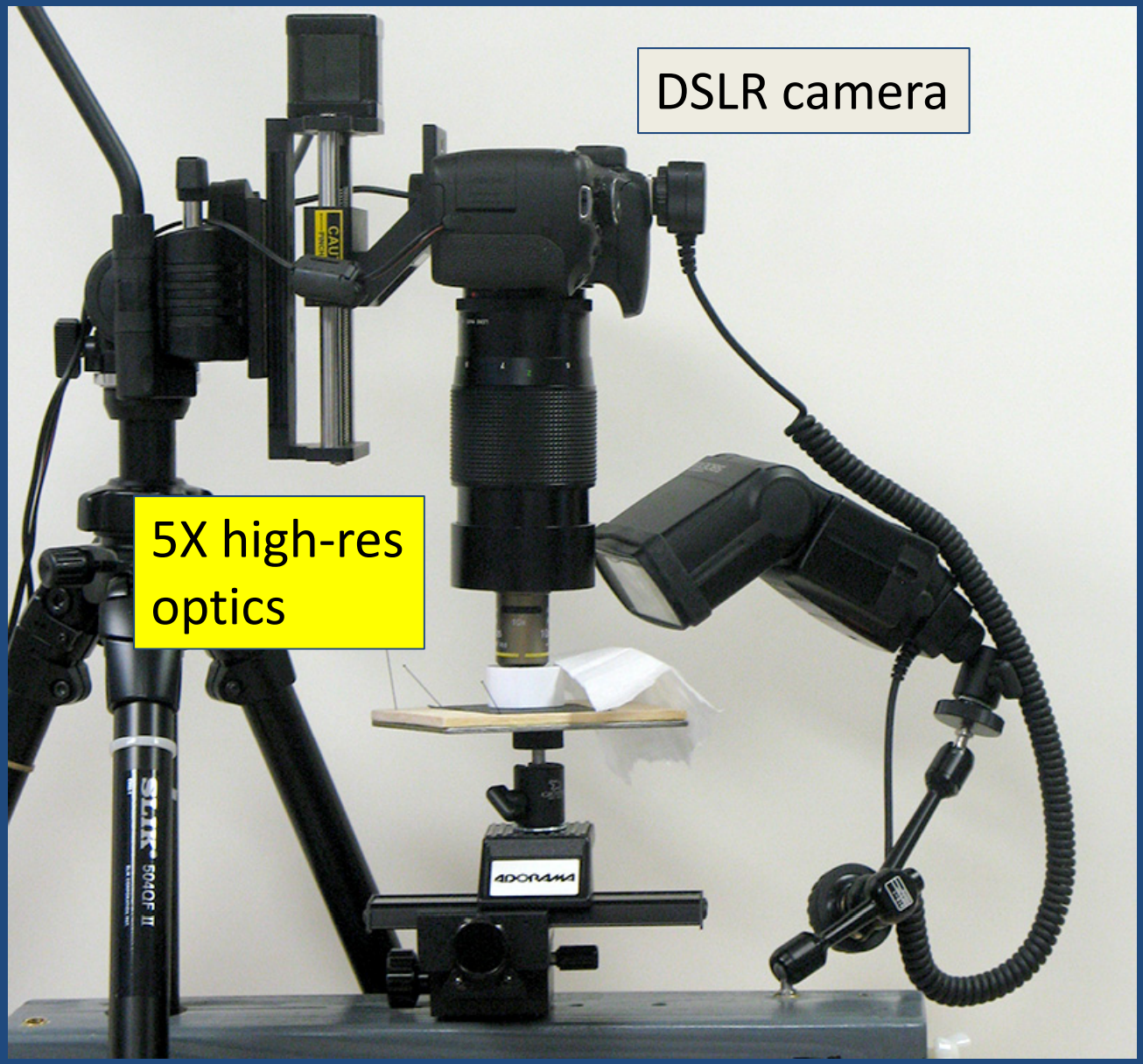

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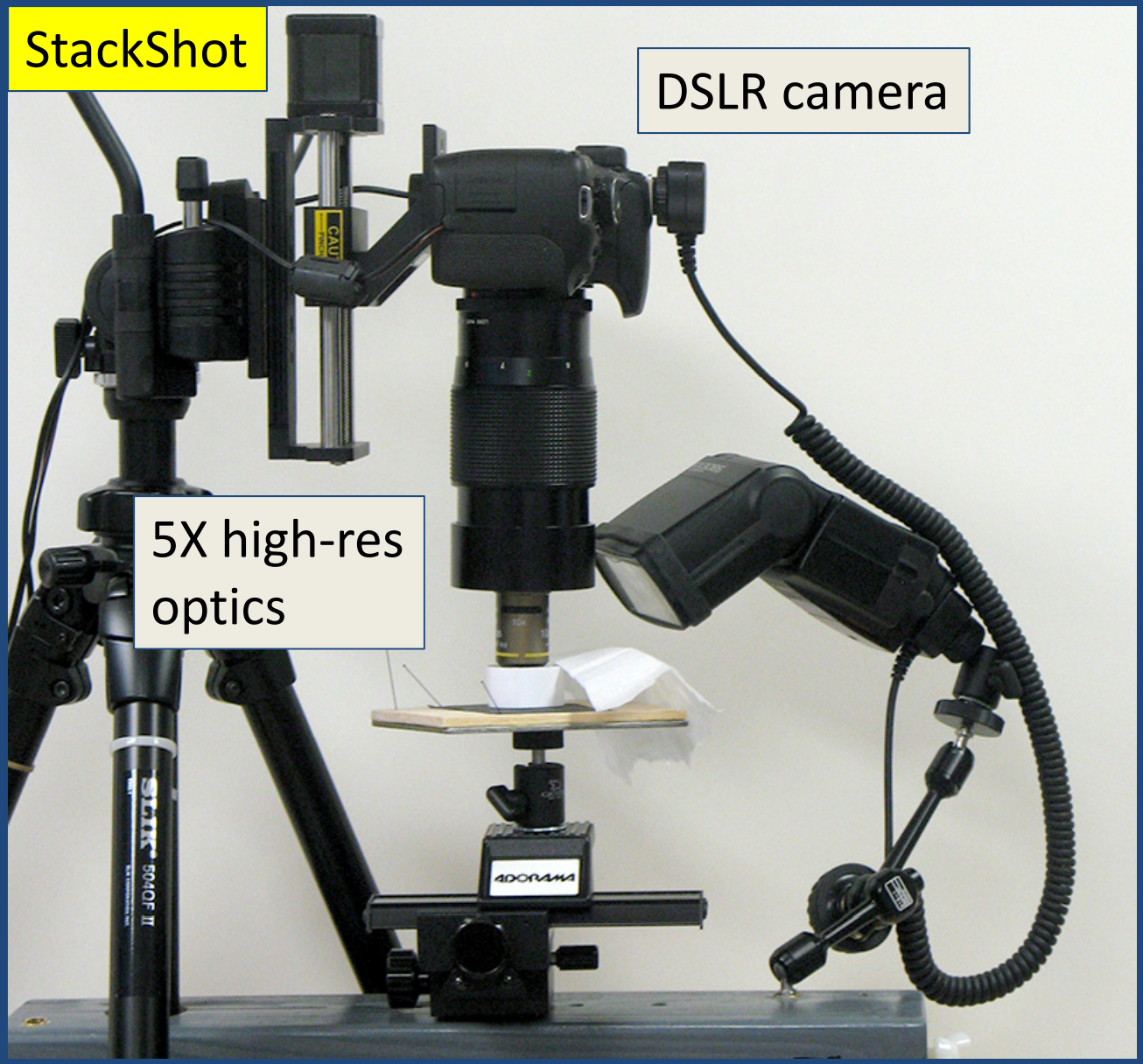

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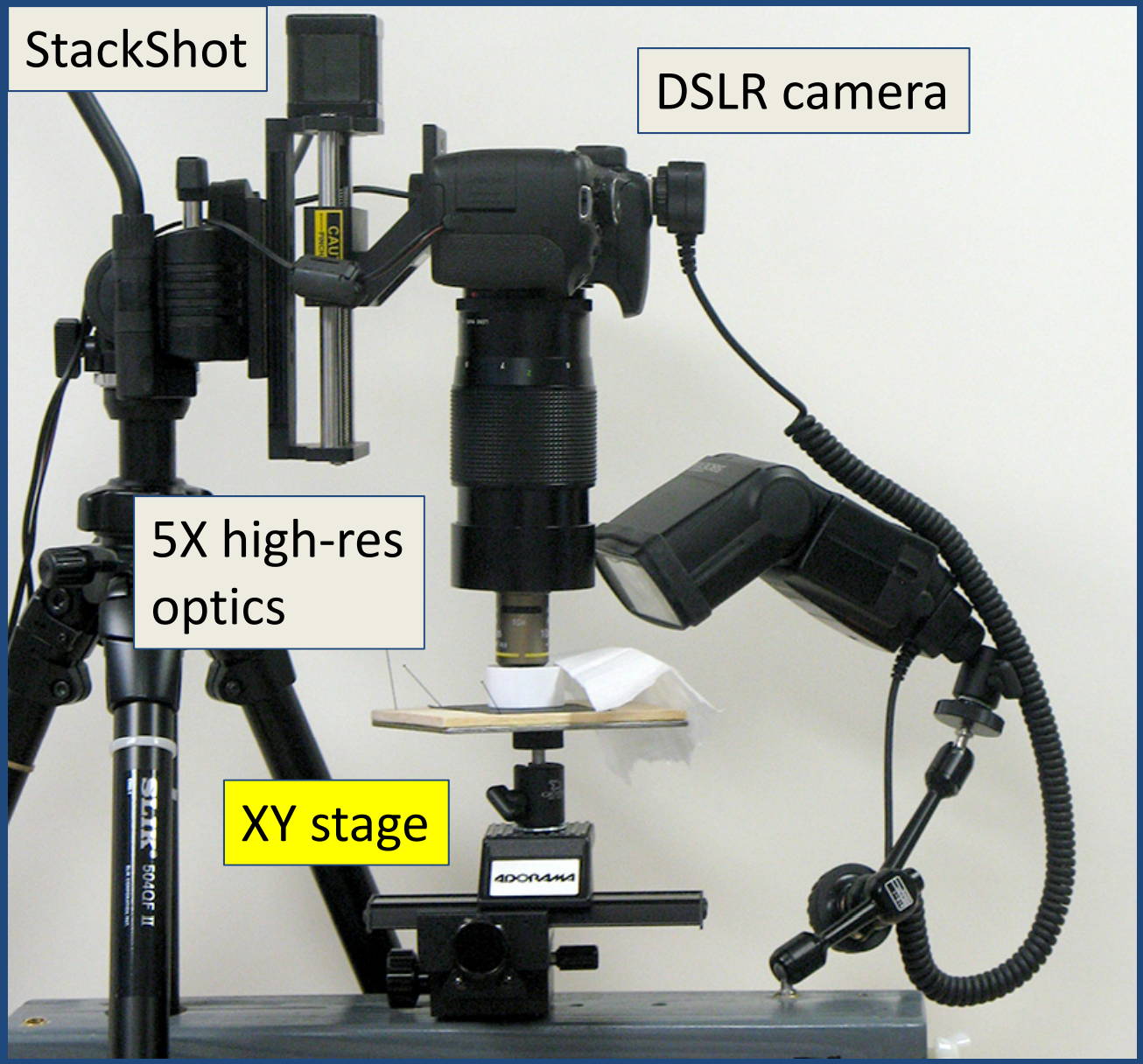

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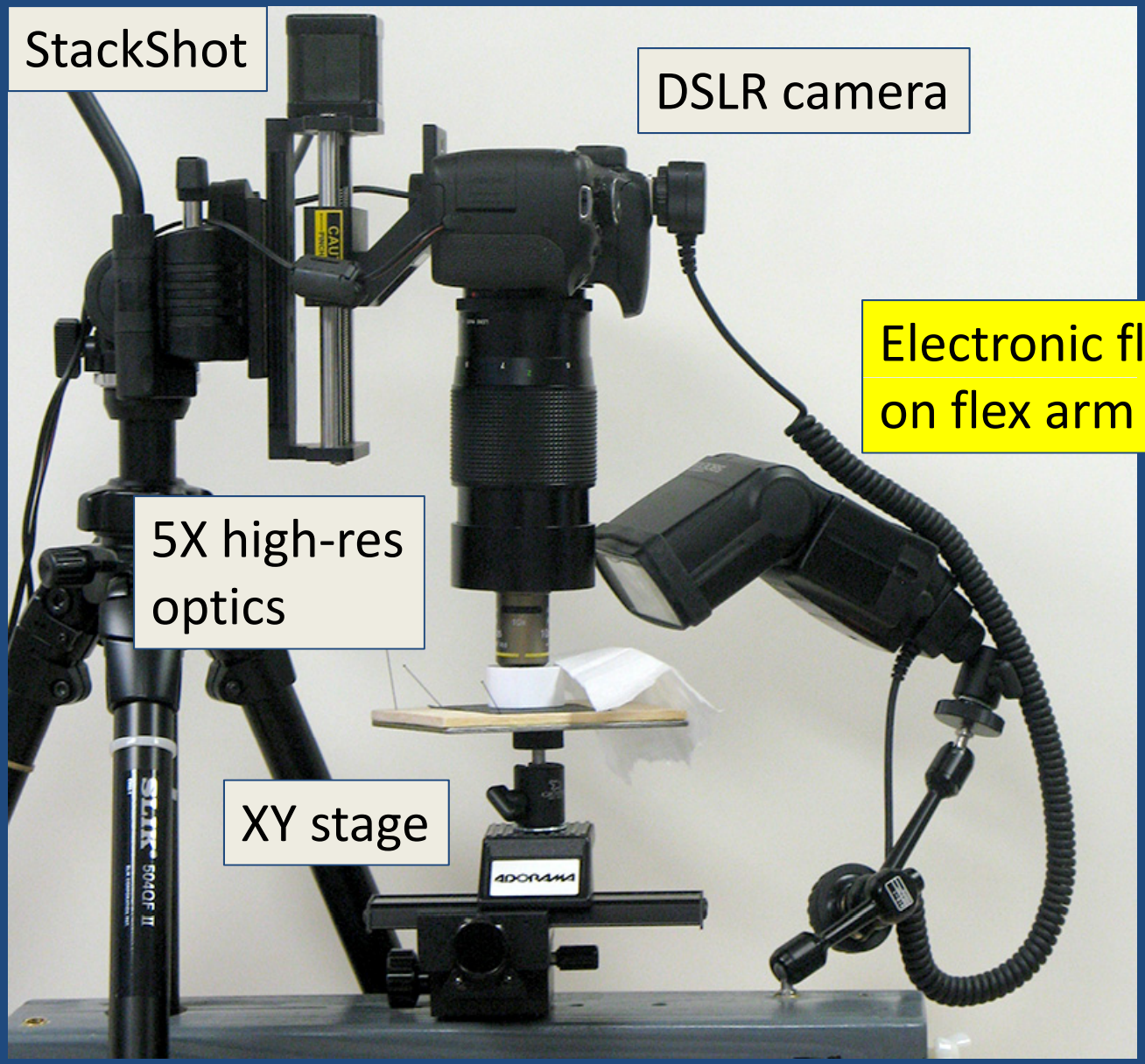

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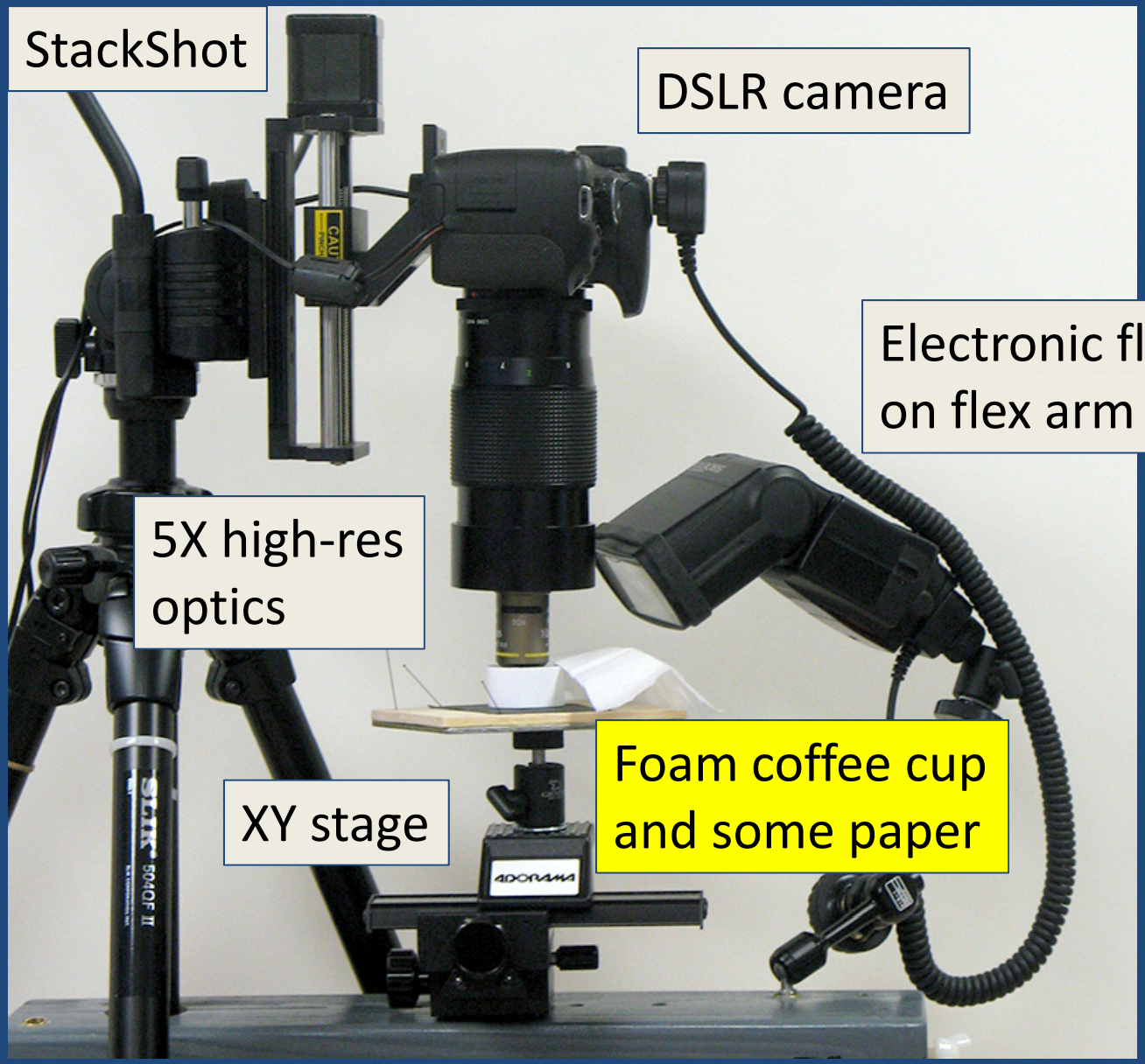

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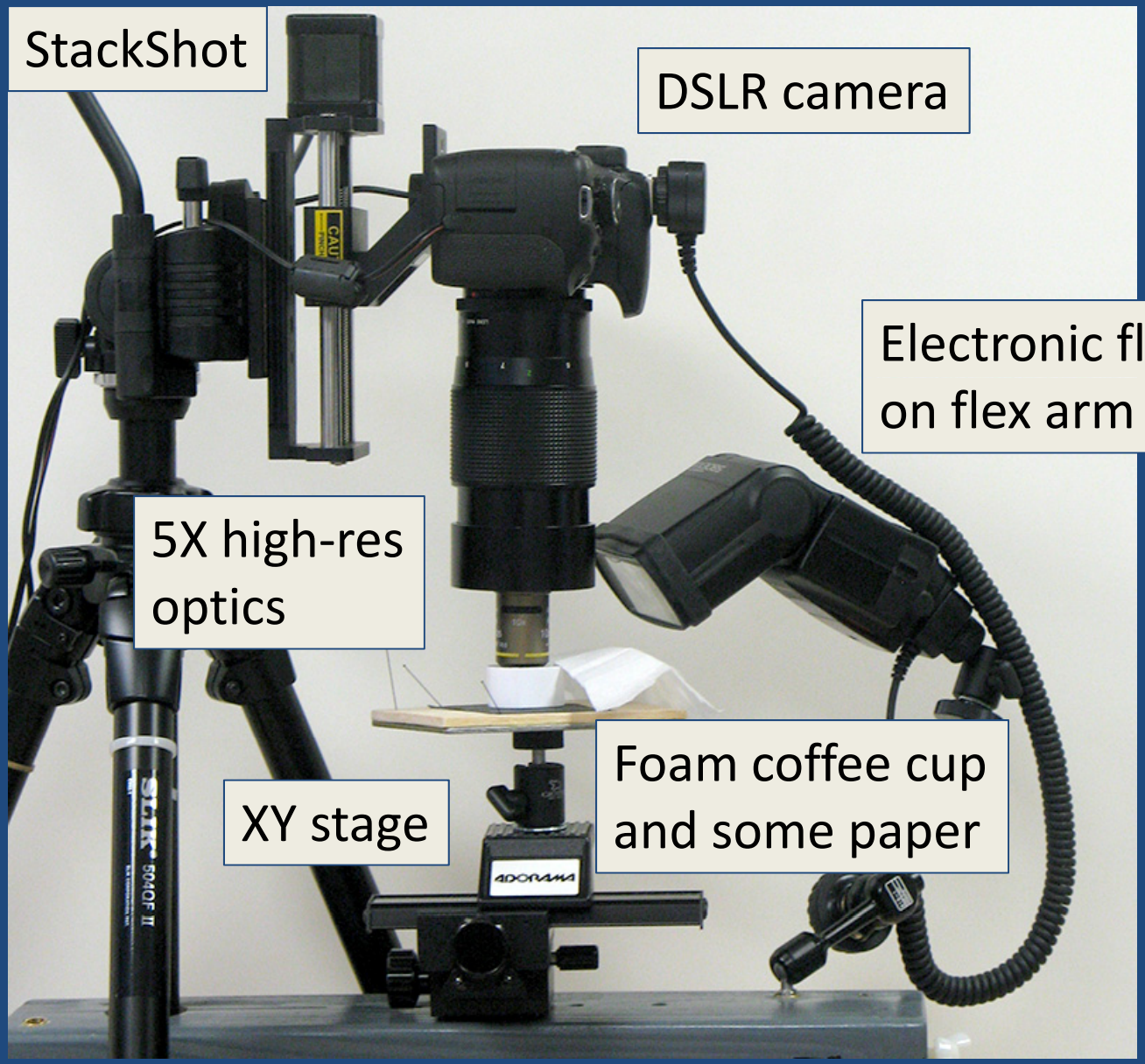
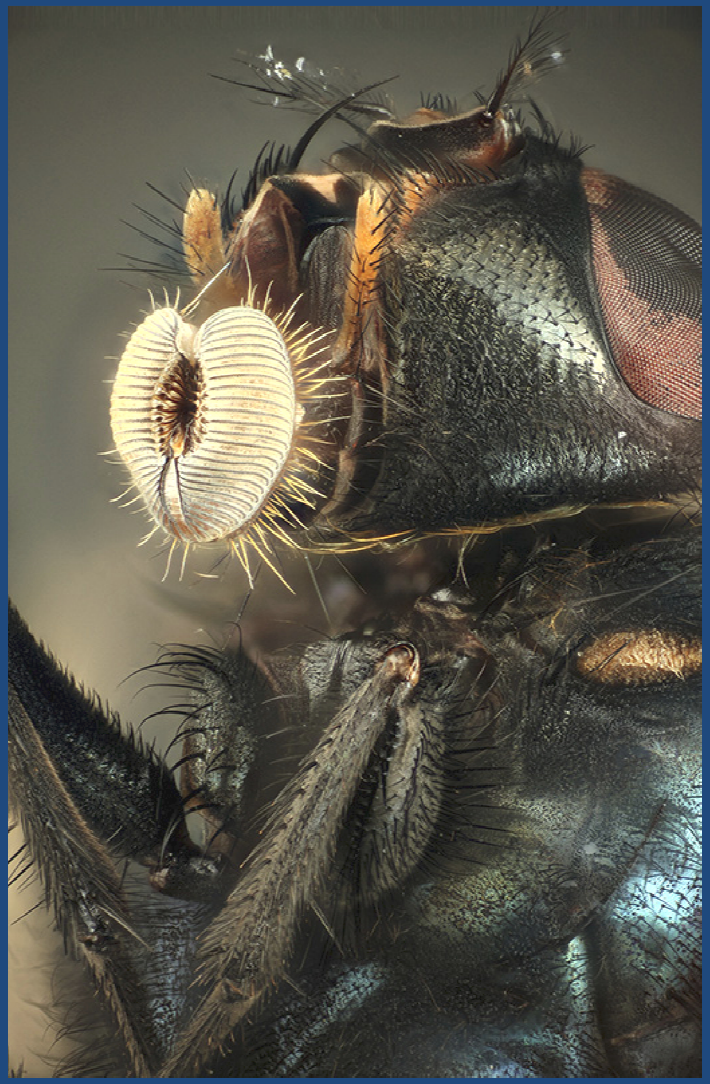


How Is This Possible???



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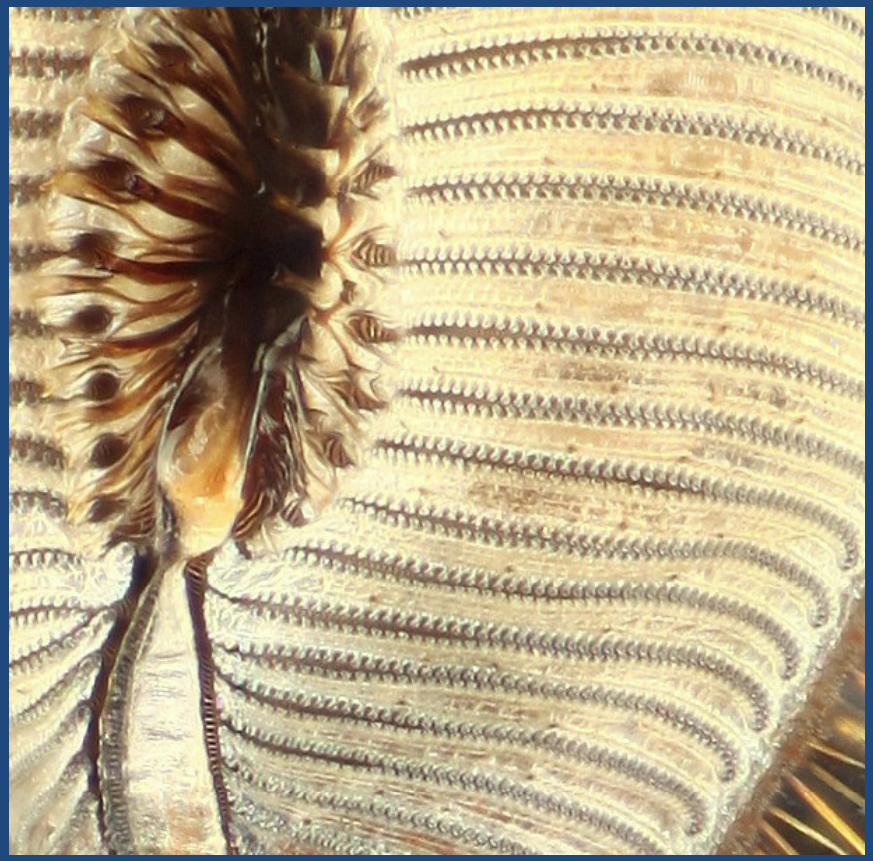
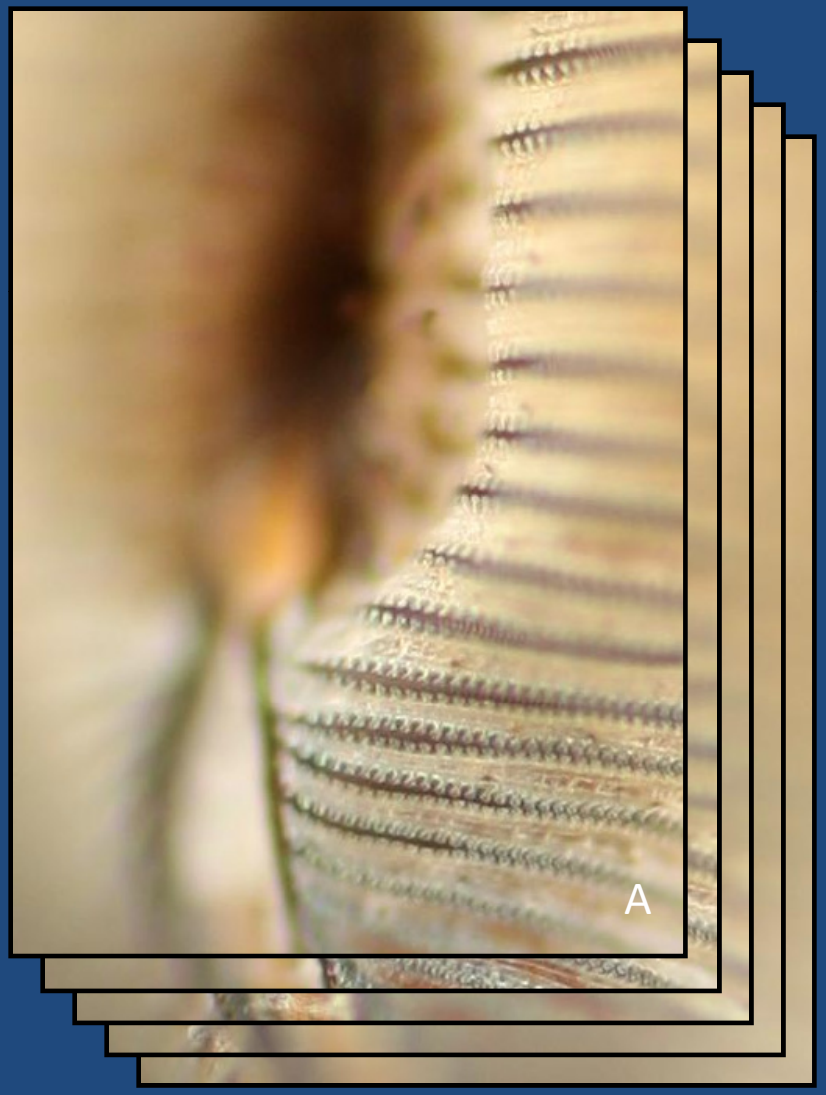


Focus Stacking: “Just pick out the sharp parts and piece them together”

High Resolution Slices



Computer Software

Zerene Stacker

Final Image

Focus Stacking: “Just pick out the sharp parts and piece them together”

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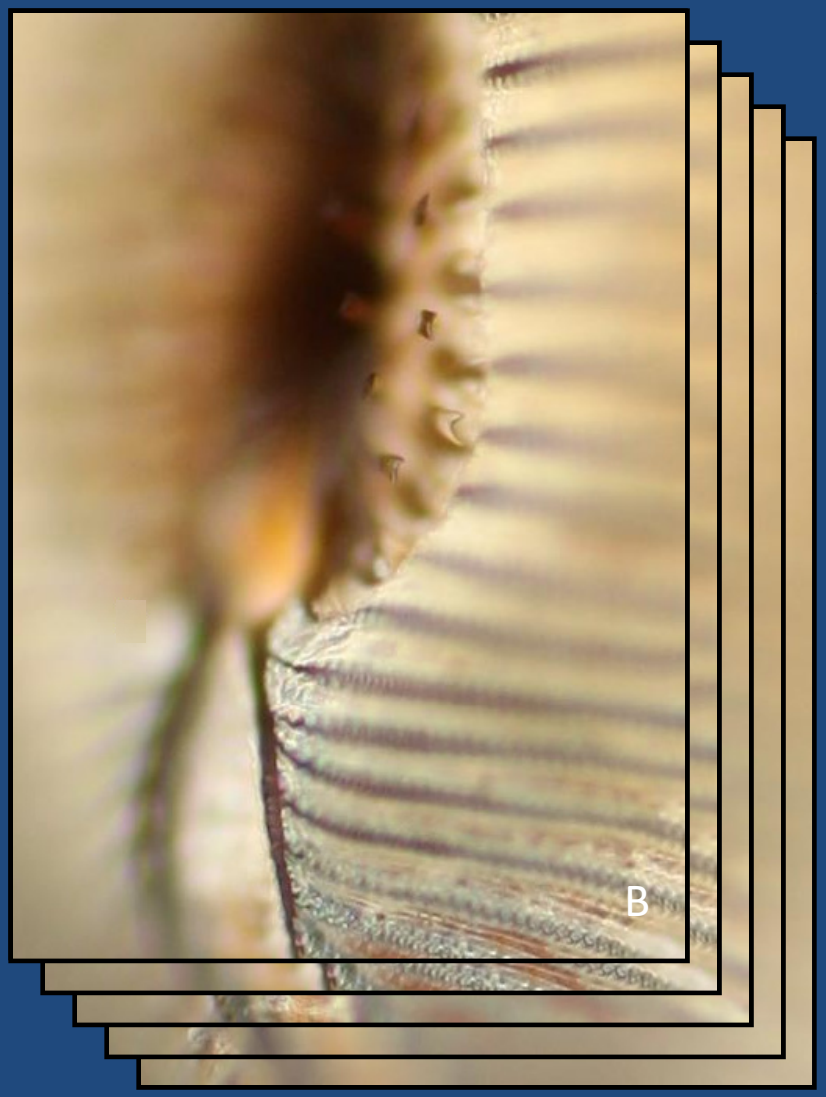

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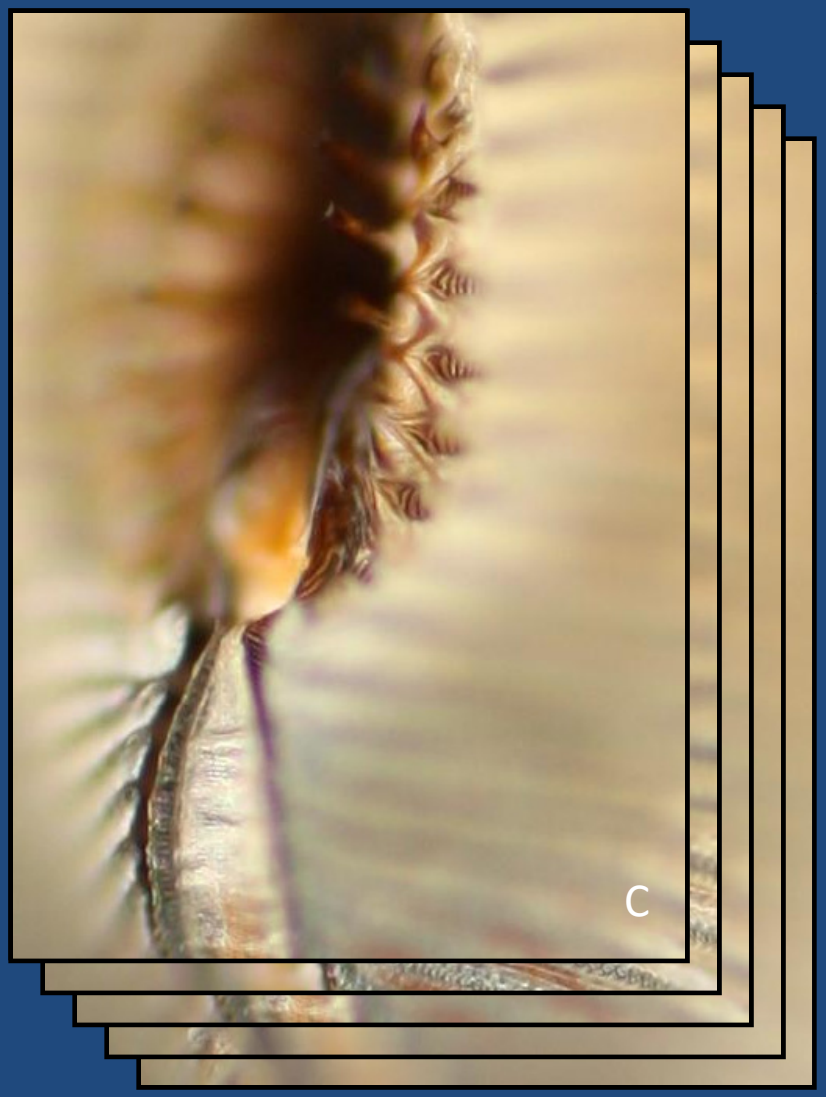

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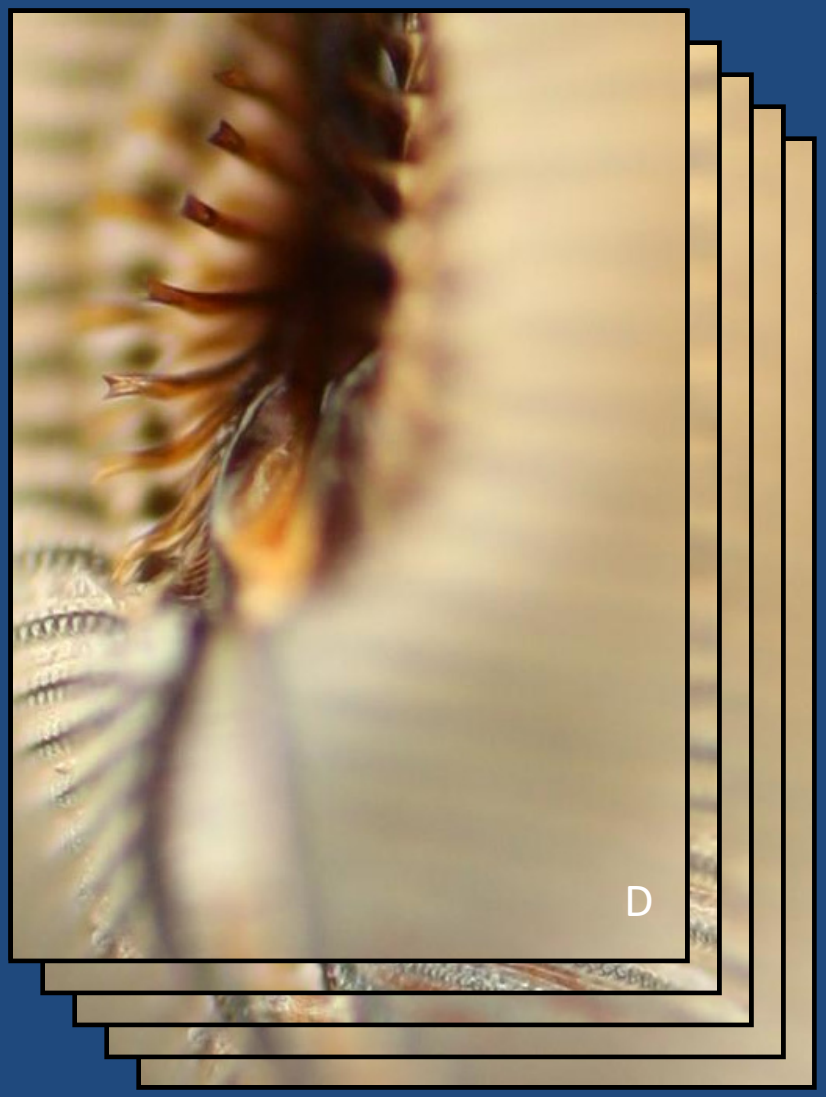

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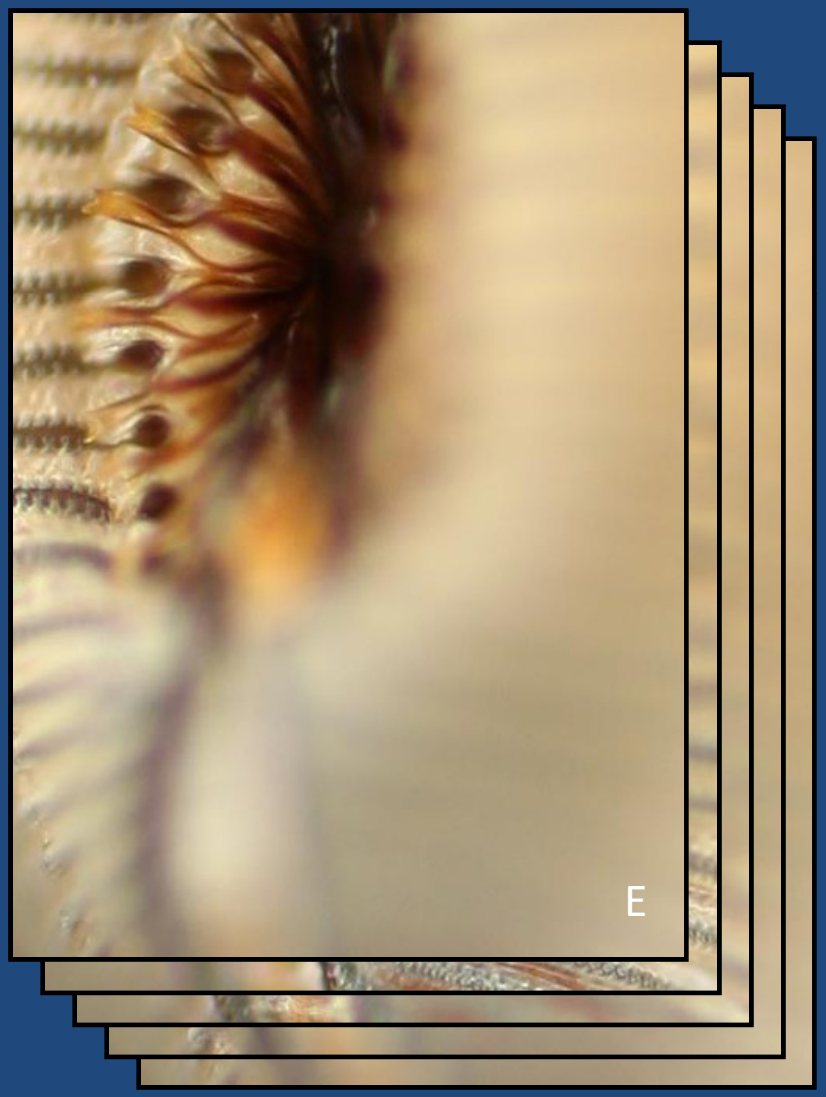

Computer Software

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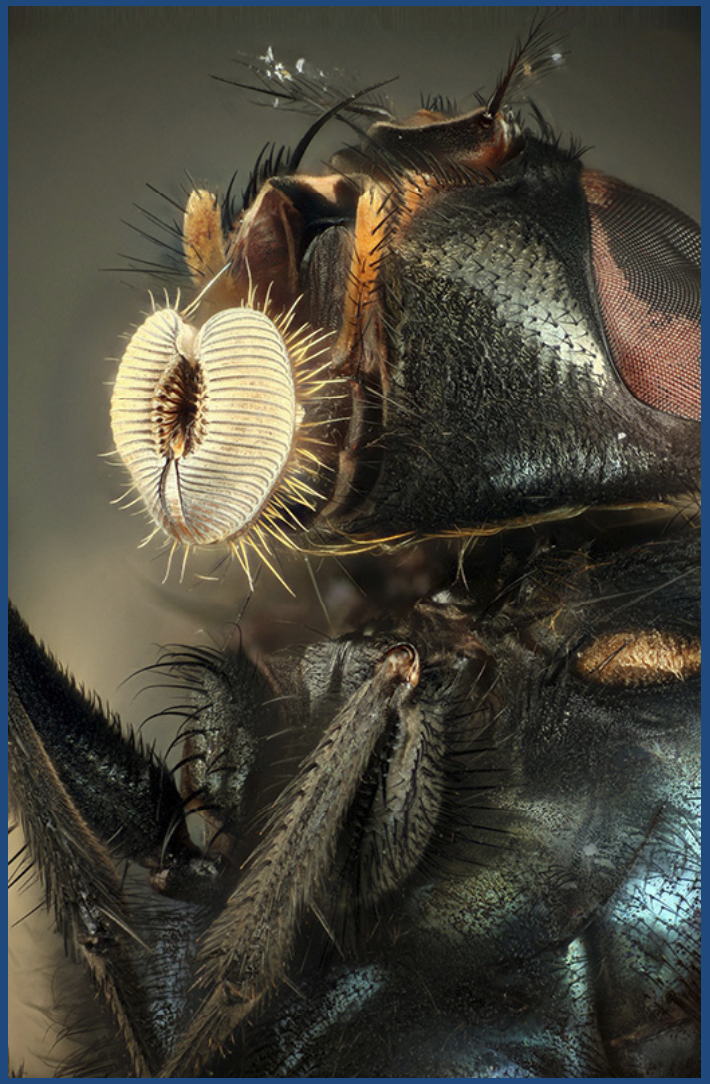
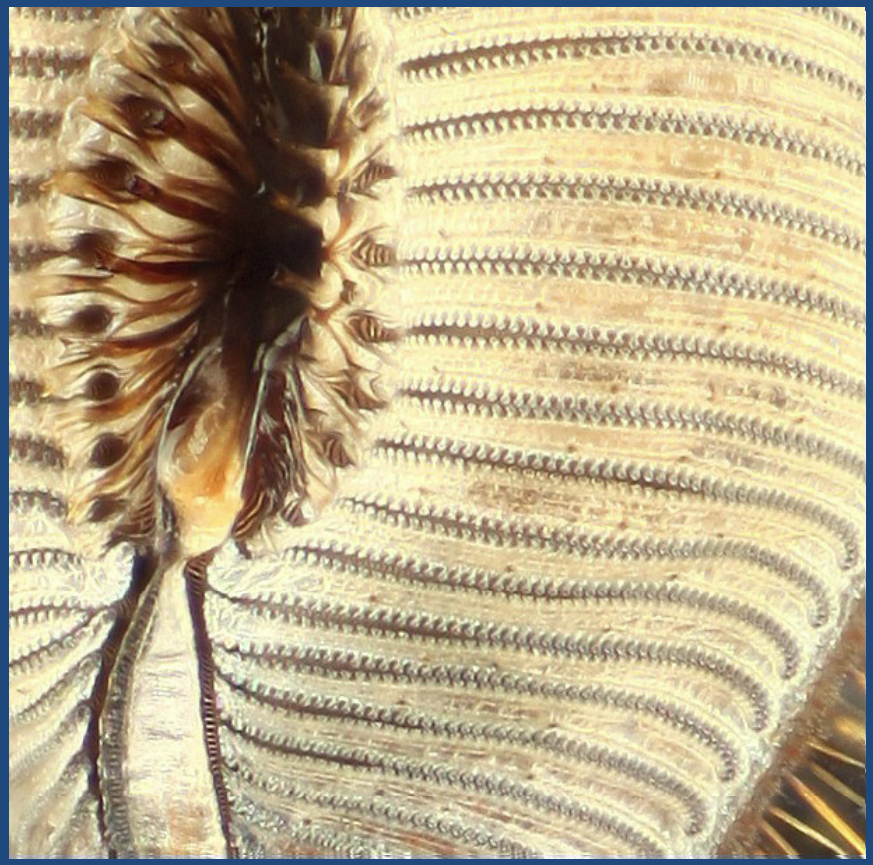
Final Image

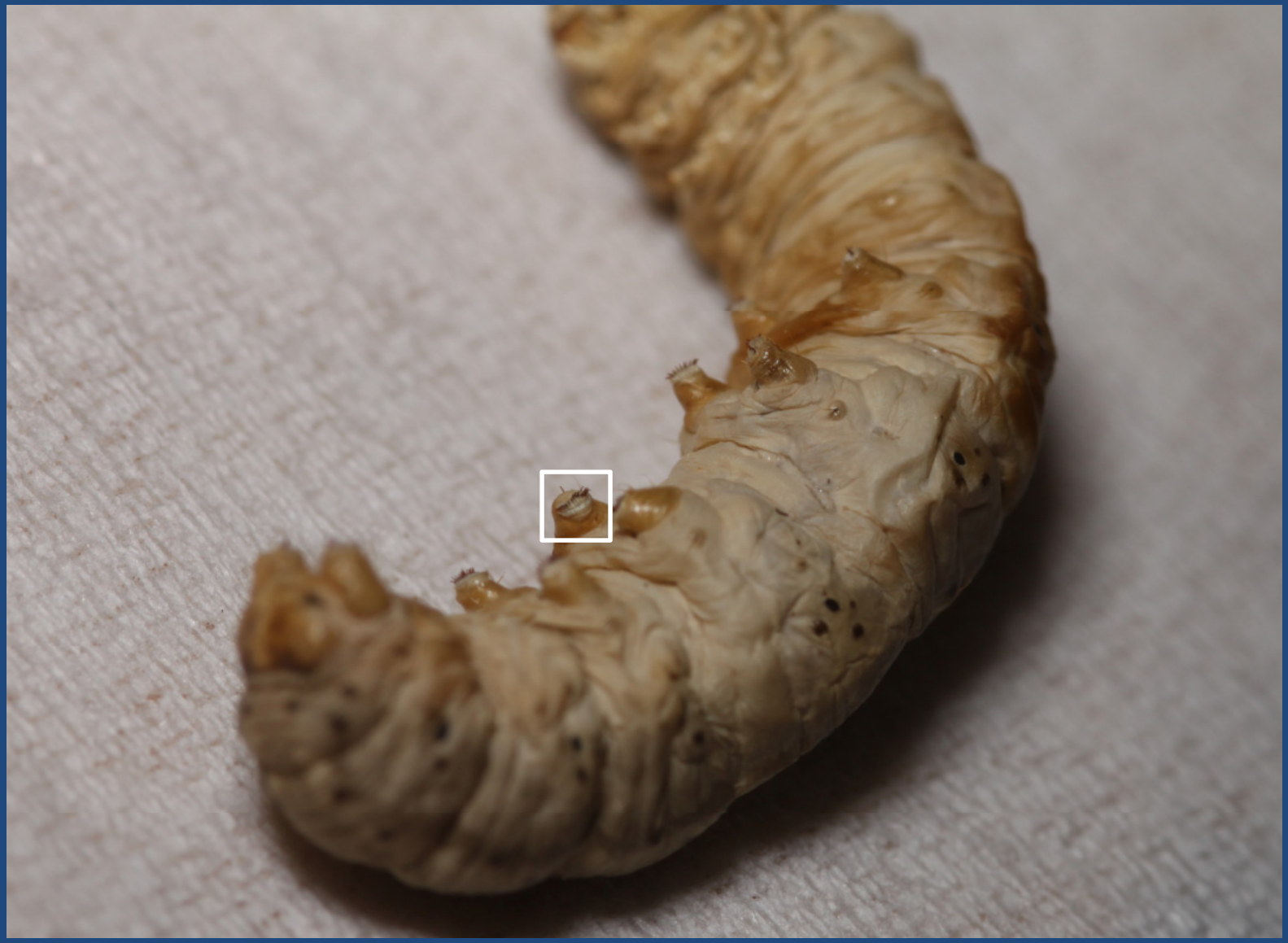
This Case: 375 frames



0.01 mm focus step,
3.75 mm depth of field,



Why Use Focus Stacking?



Here's The Picture We Want

0.2 mm

But The Camera Sees This

0.2 mm

Why Not Just Stop Down??

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Because diffraction makes images **blurred**

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It's because of the wave properties of light.

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Because diffraction makes images **blurred**

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If you really want to know more, see me later...

As we stop down...

f/2

(effect. f/26)

What we want

As we stop down...

f/2.8

(effect. f/36)

What we want

As we stop down...

f/4

(effect. f/52)

What we want

As we stop down...

f/5.6

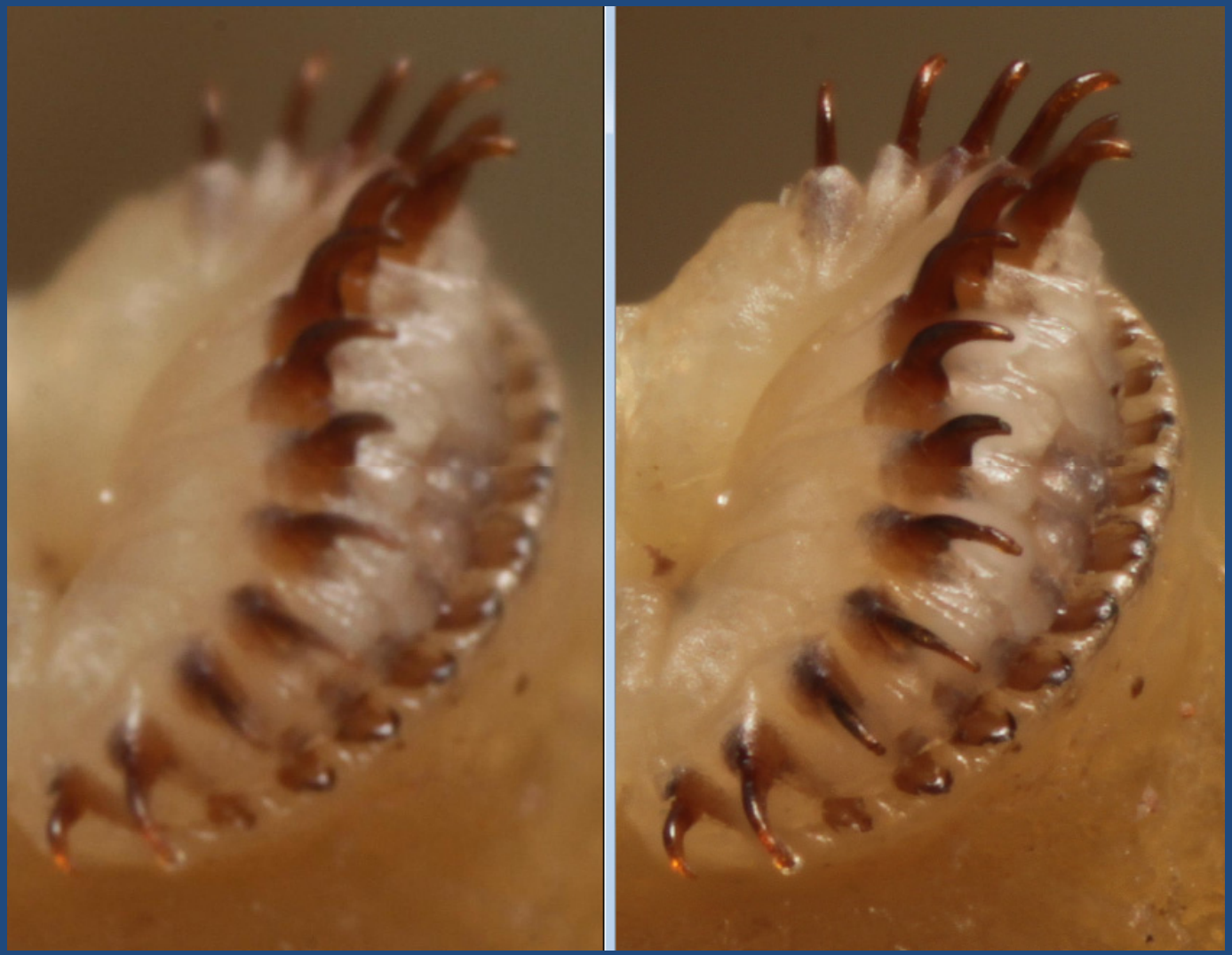
(effect. f/73)

What we want

As we stop down...

f/8

(effect. f/104)

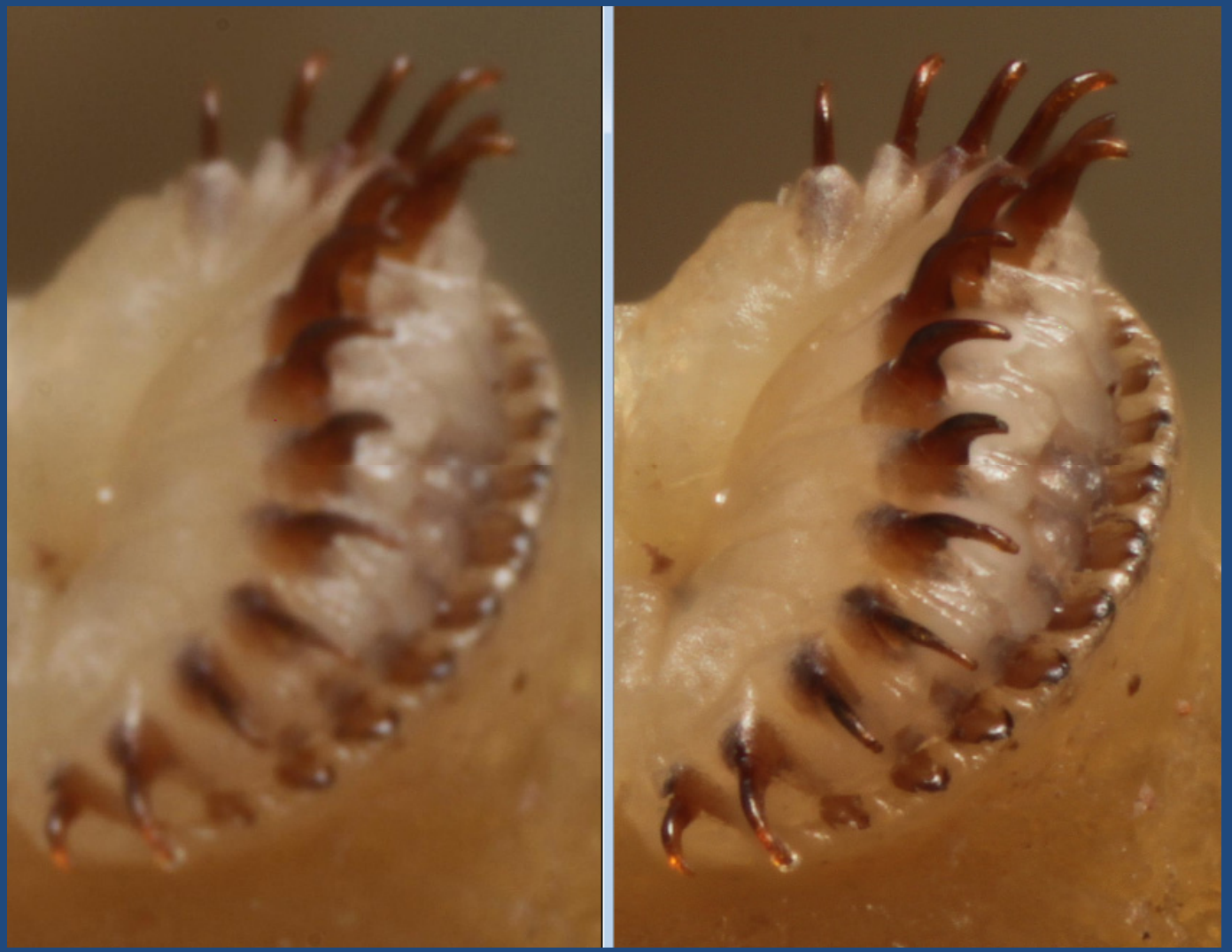


What we want

As we stop down...

f/11

(effect. f/143)

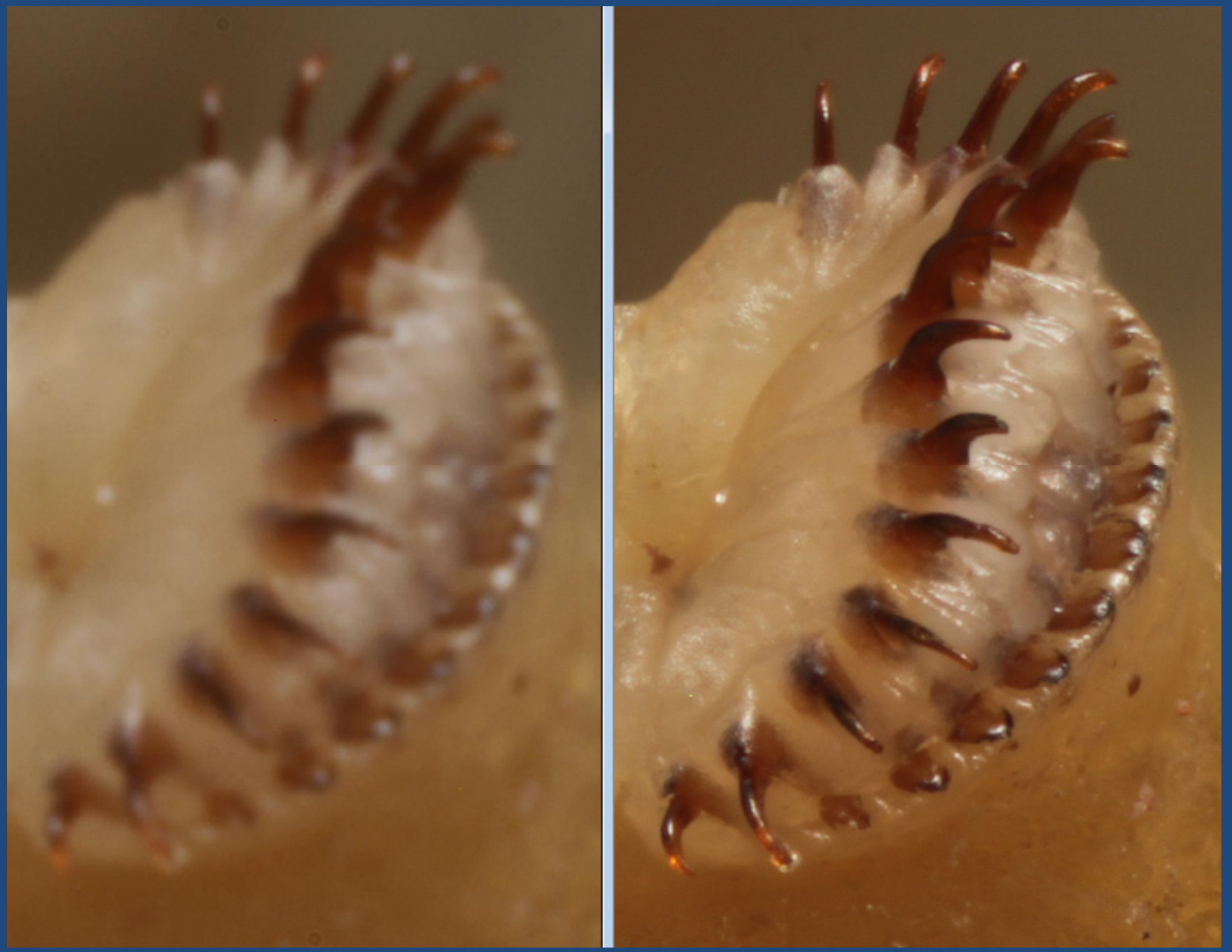


What we want

As we stop down...

f/16

(effect. f/208)

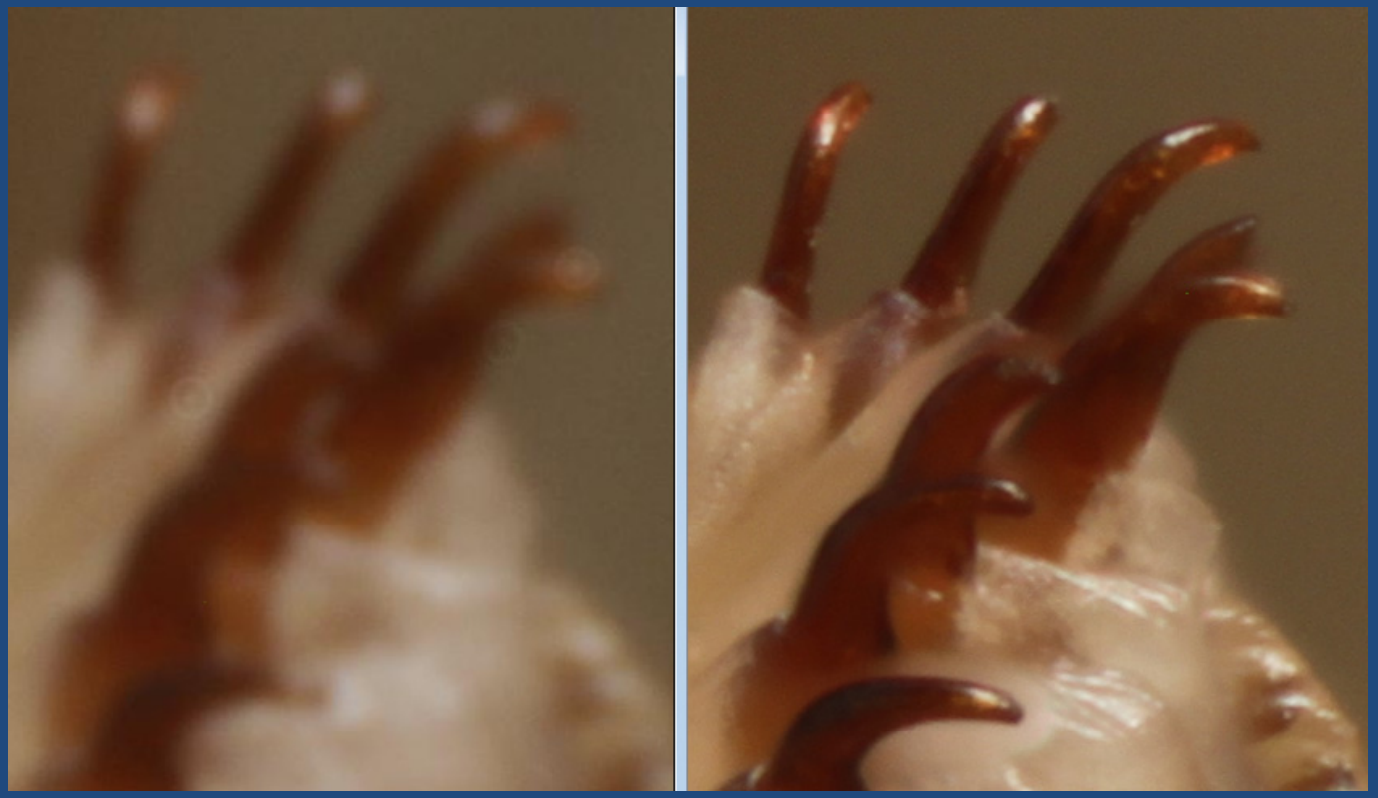


What we want

Stopping down doesn't work...

f/16

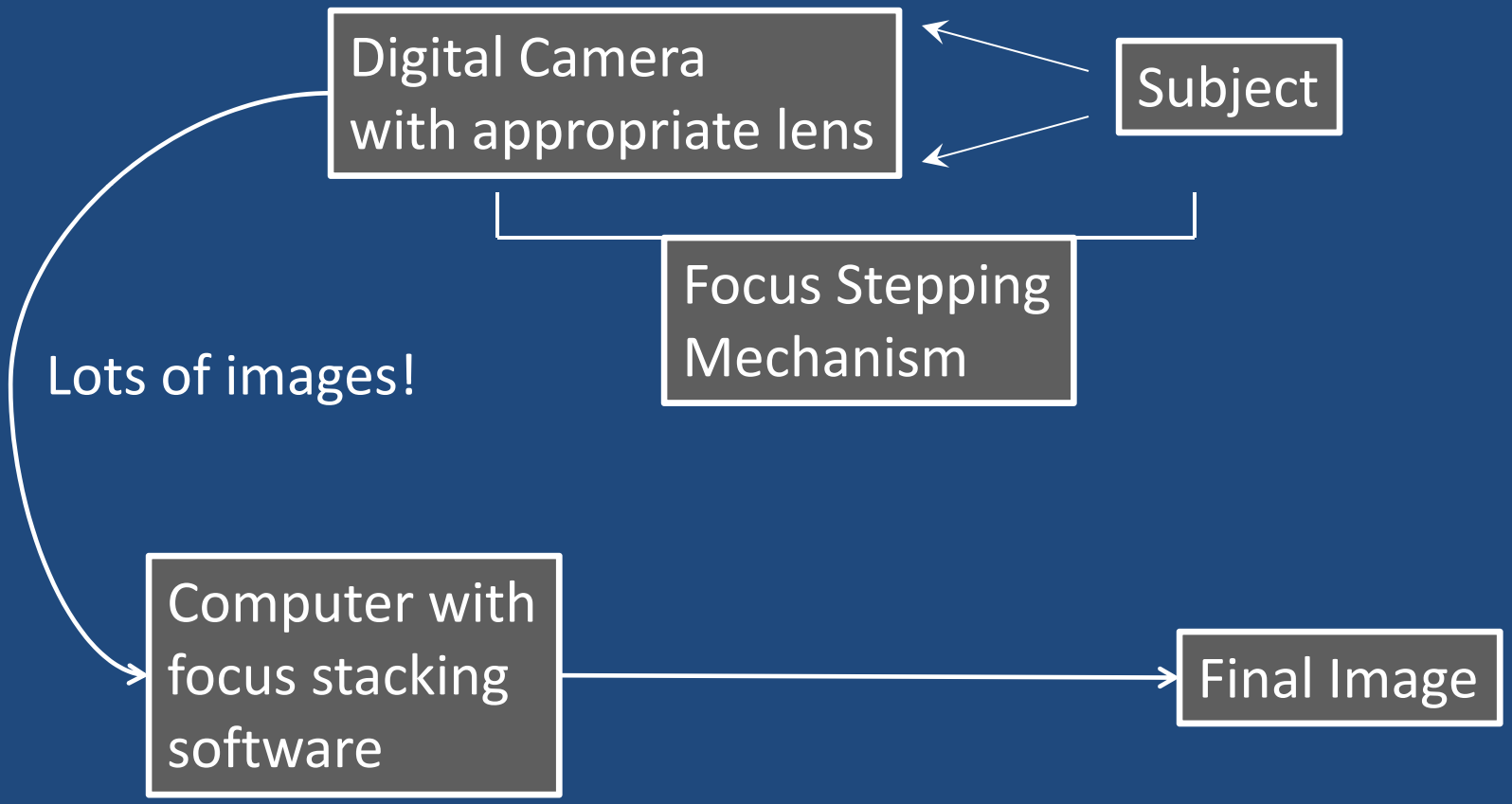
(effect. f/208)



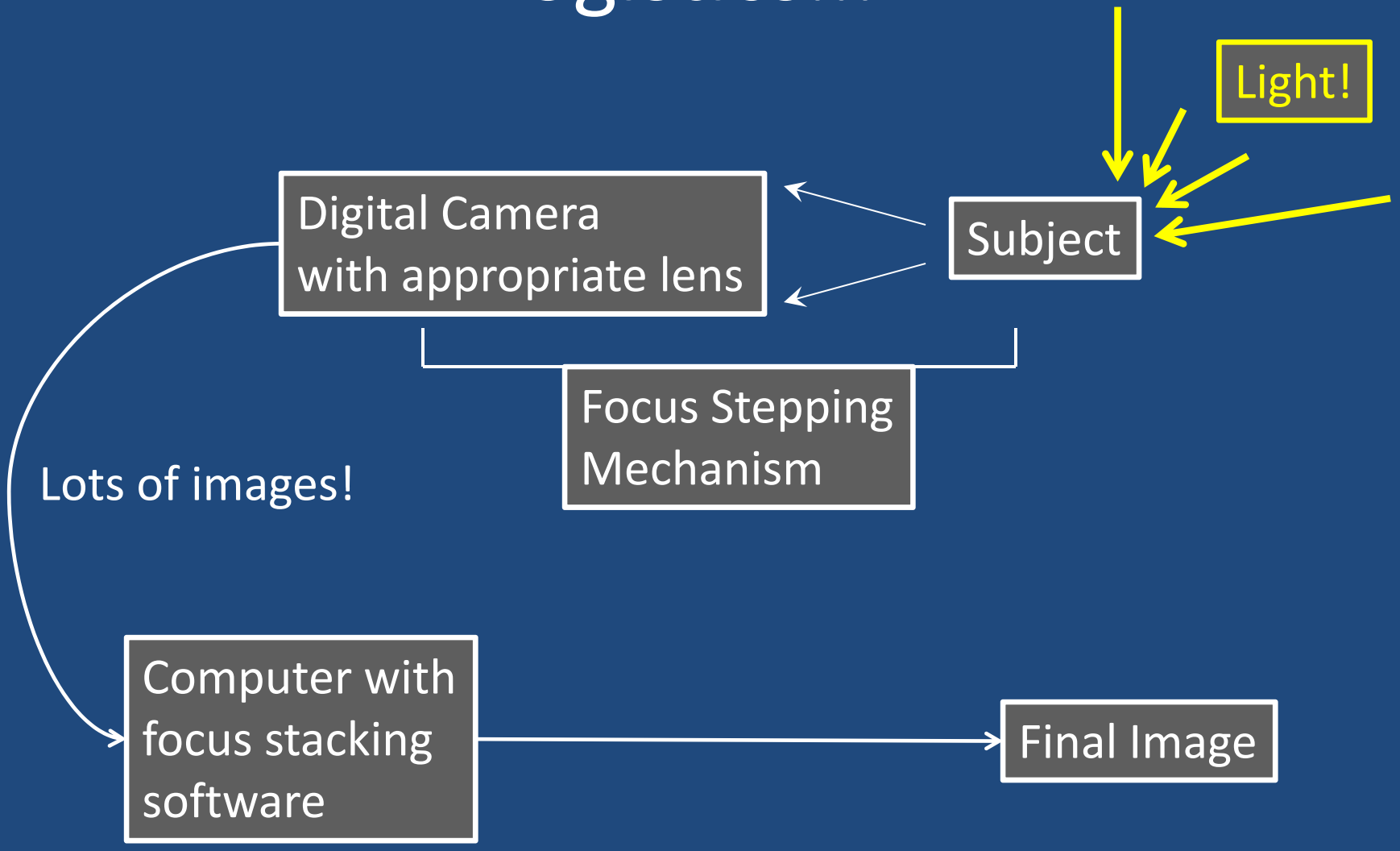
What we want

...because stopping down makes the image blurred!

Logistics...


Digital Camera
with appropriate lens
Subject
Focus Stepping
Mechanism
Lots of images!
Computer with
focus stacking
software
Final Image

Logistics...


Light!
Digital Camera
with appropriate lens
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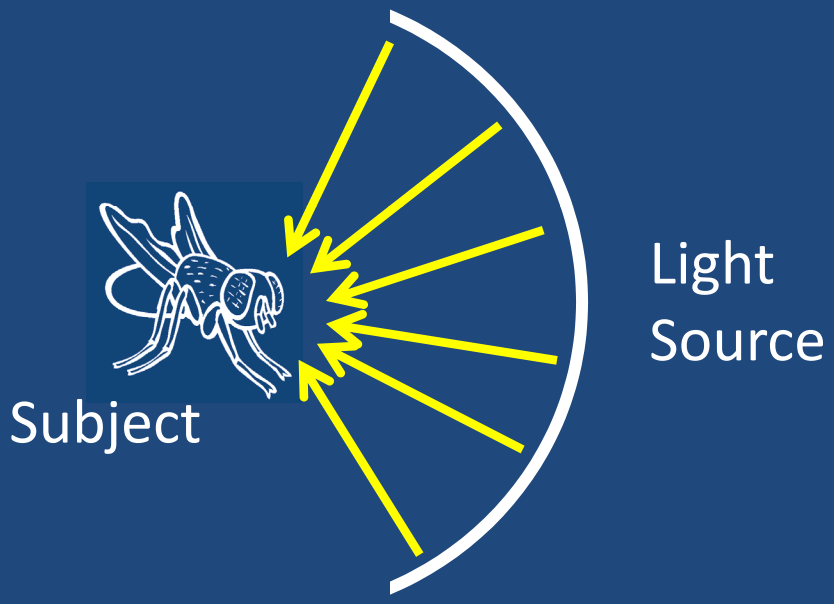
Good Lighting Is “Diffused”

(Hits subject from wide range of angles)



Naked Lights Are Bad

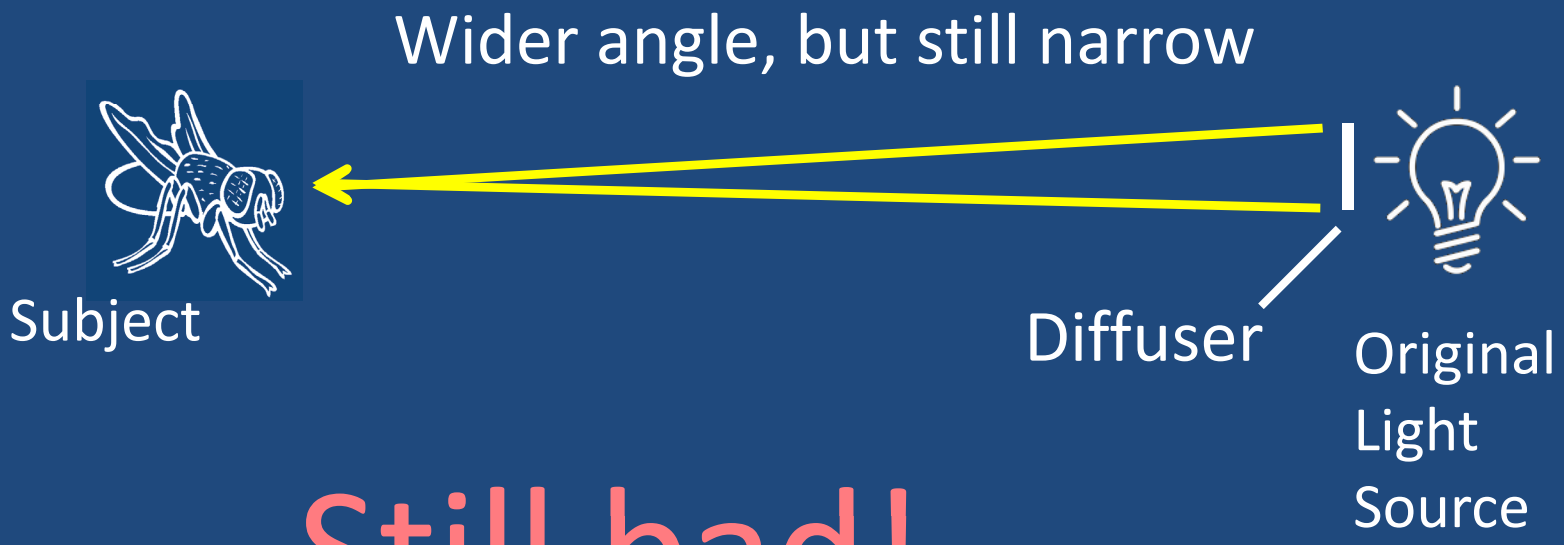
Subject

Narrow range of angles

Light Source

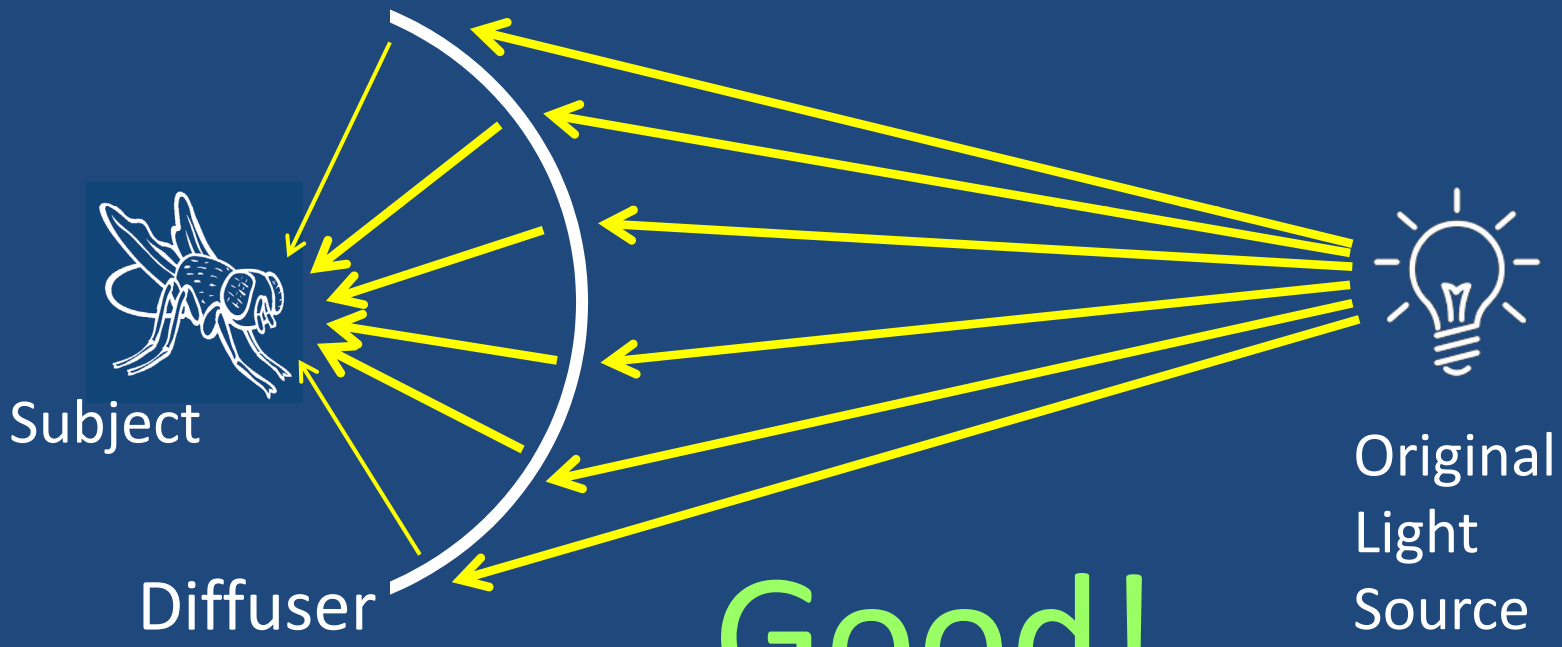
Awful!

Adding Diffuser At Source Helps, But Not Much



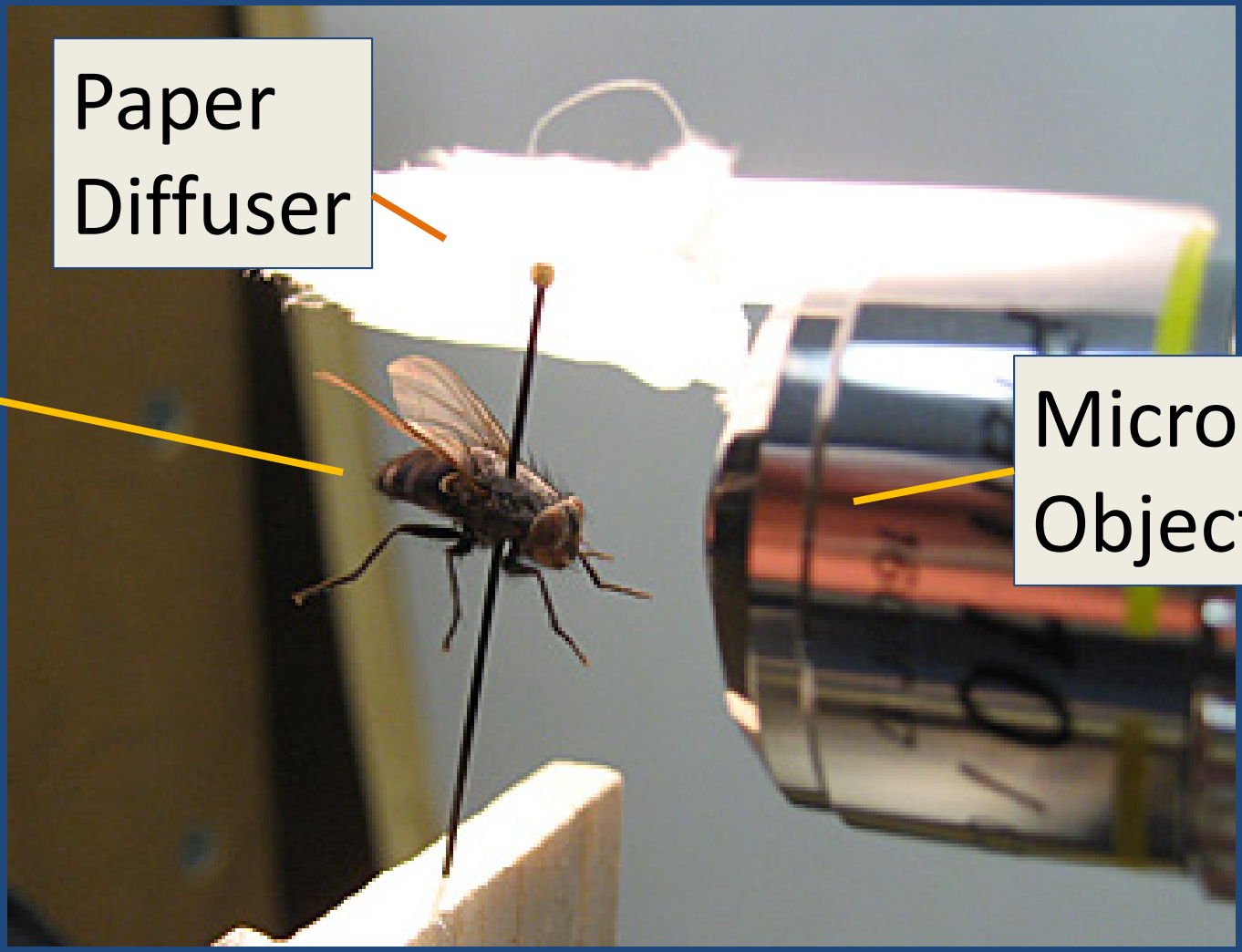
Still bad!

Put Diffuser Close To Subject



Good!

An Extreme Example – The Setup



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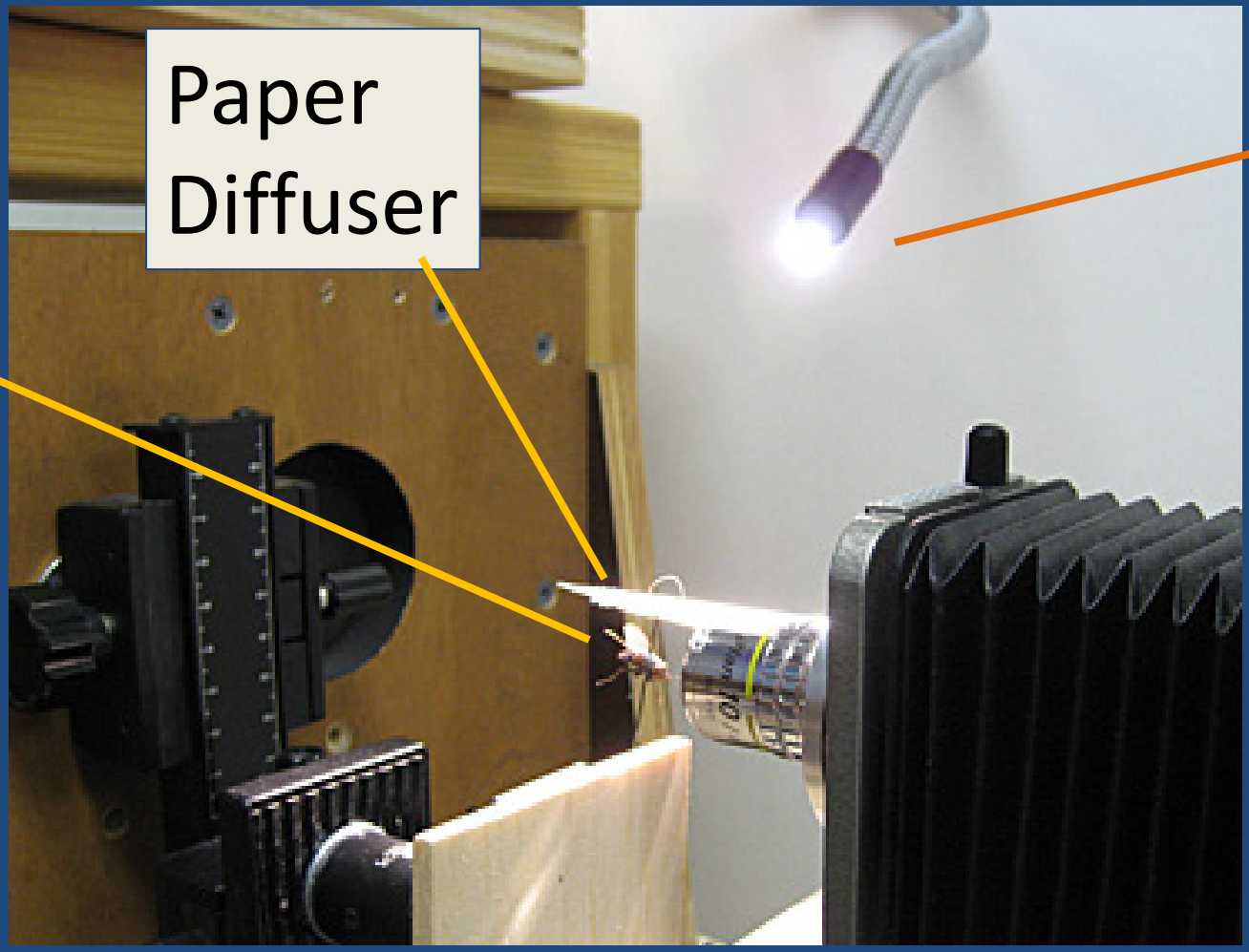
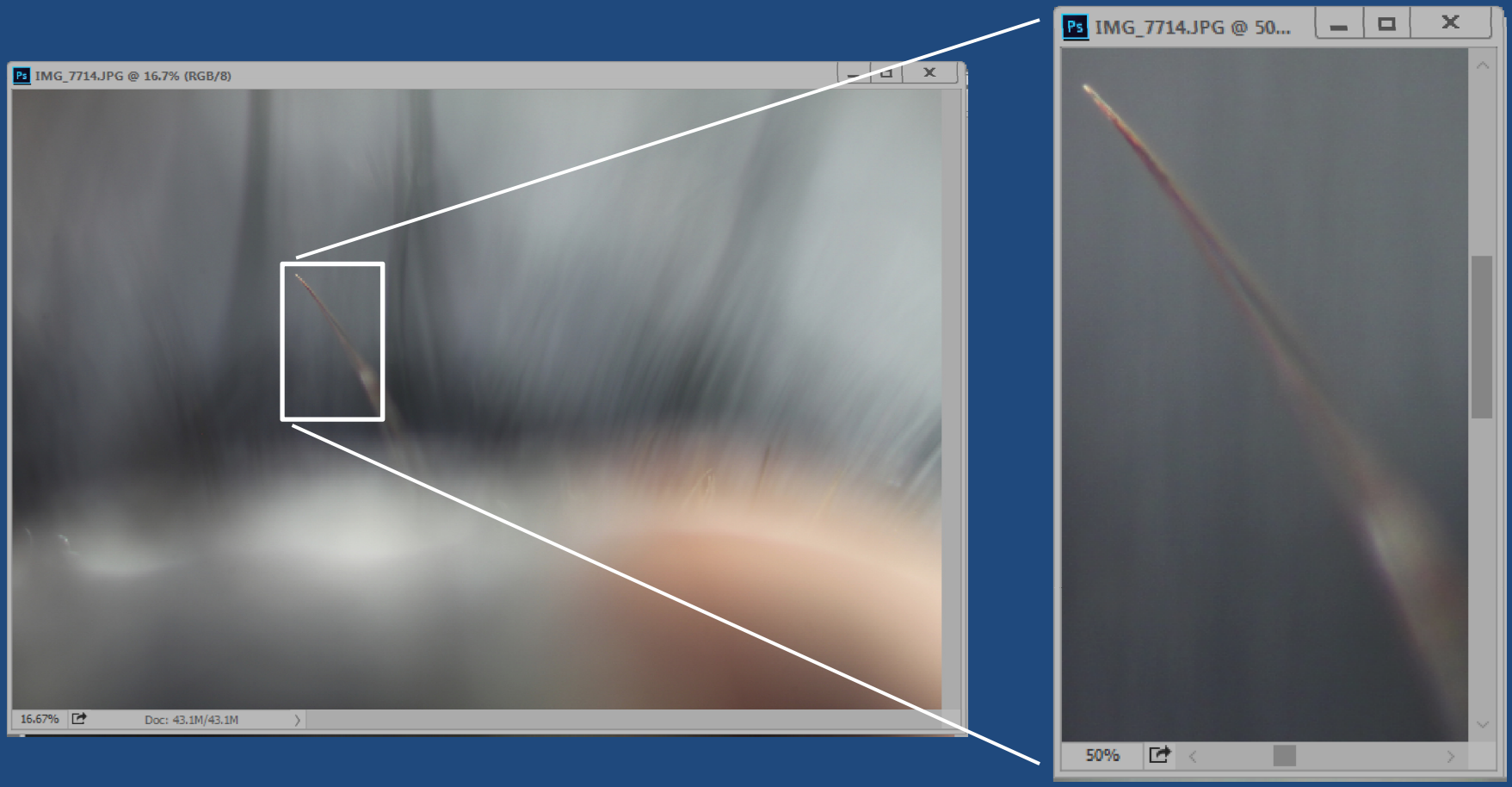


What The Camera Sees (with the diffuser)



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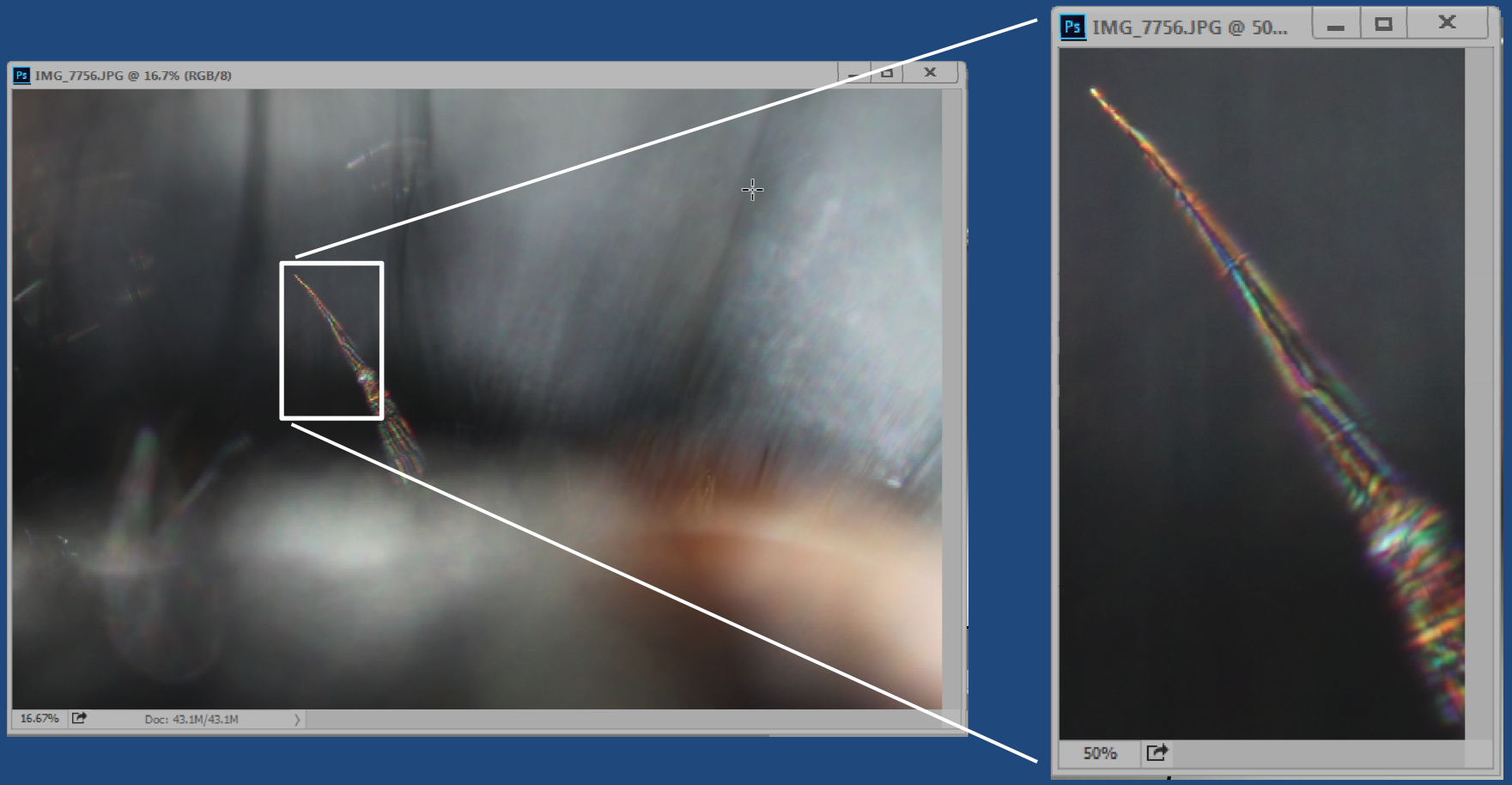
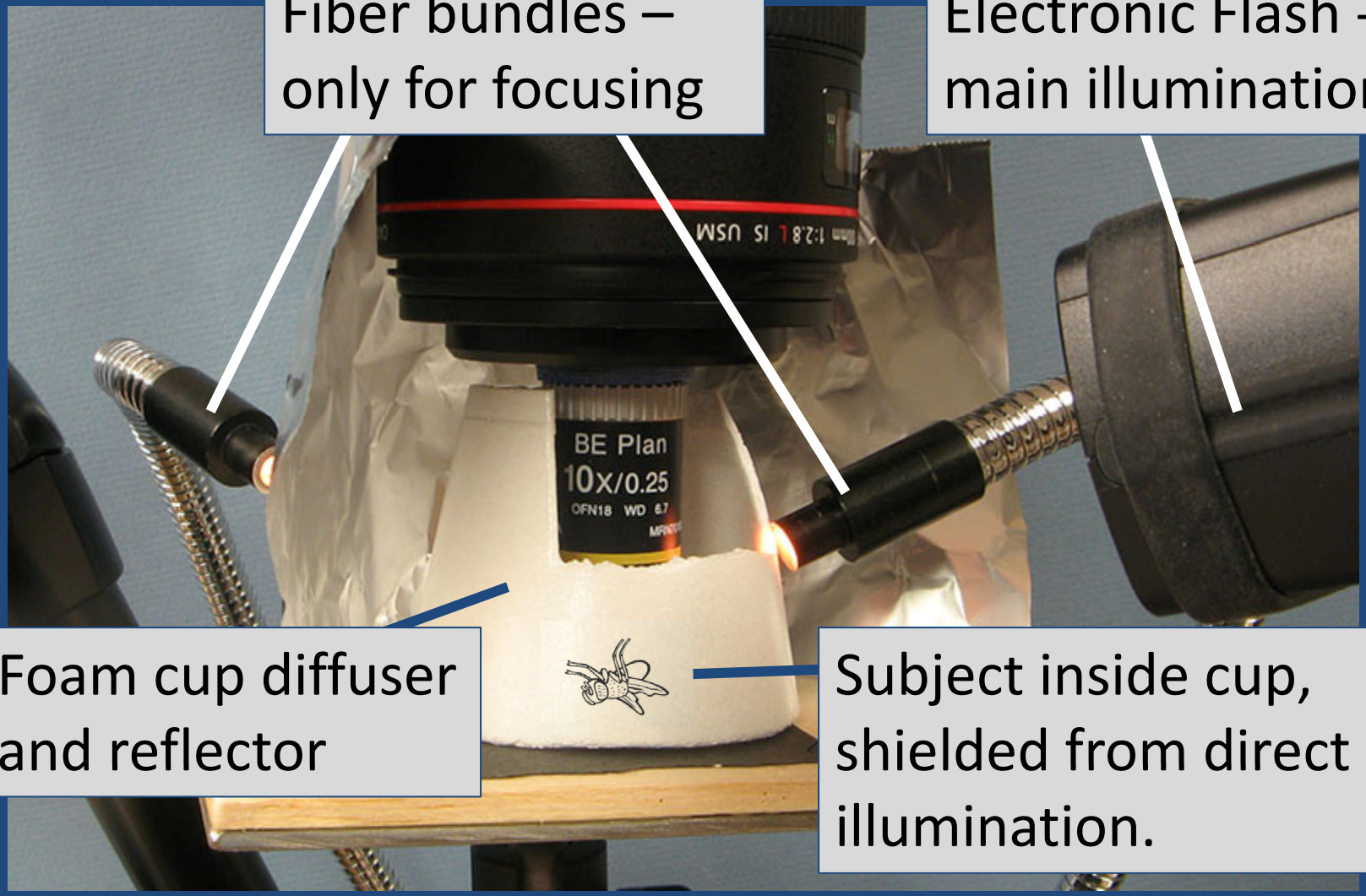
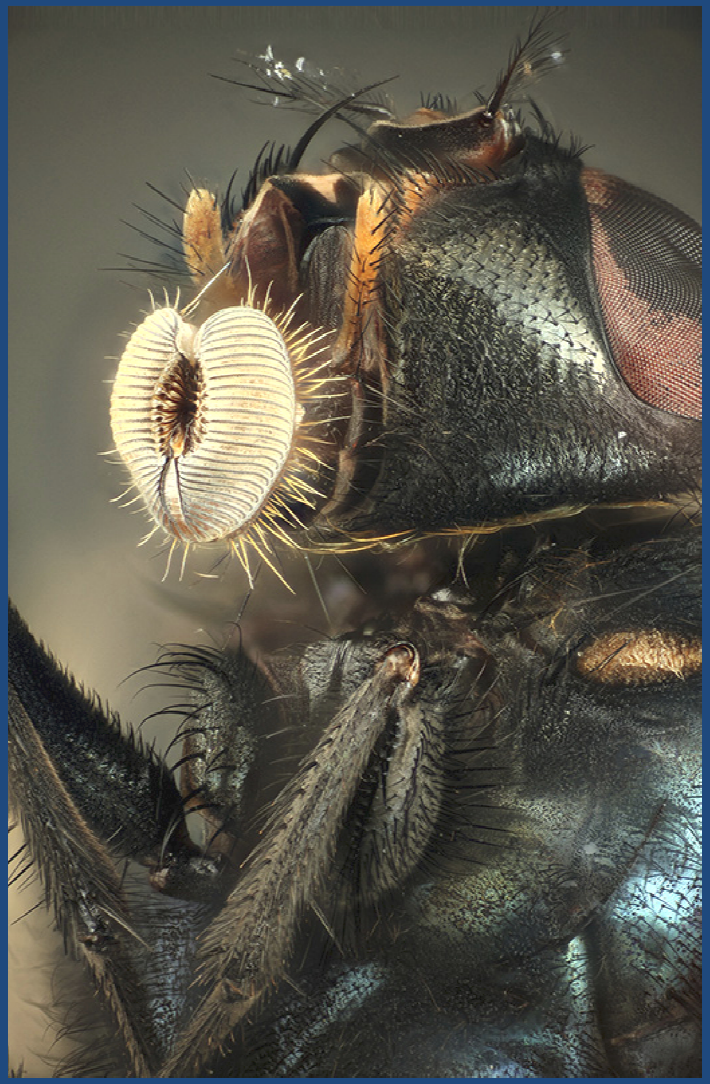


This is a lot like laser speckle.

Here's How The Blowfly Was Shot



And Here's That Result Again



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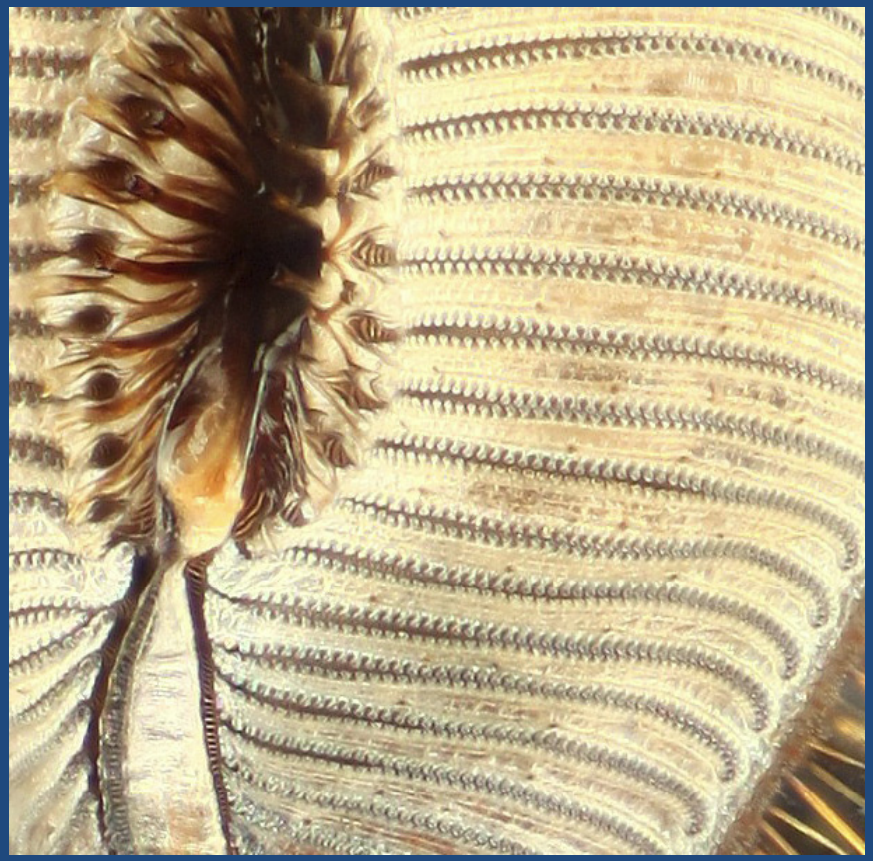


Recap So Far…

- What focus stacking is
- Why we have to do it
- Why diffuse illumination is important

What Else?

- What focus stacking is
- Why we have to do it
- Why diffuse illumination is important
- Stop down as far as sharpness allows
- Try multiple stacking methods
- Expect to use retouching for best results

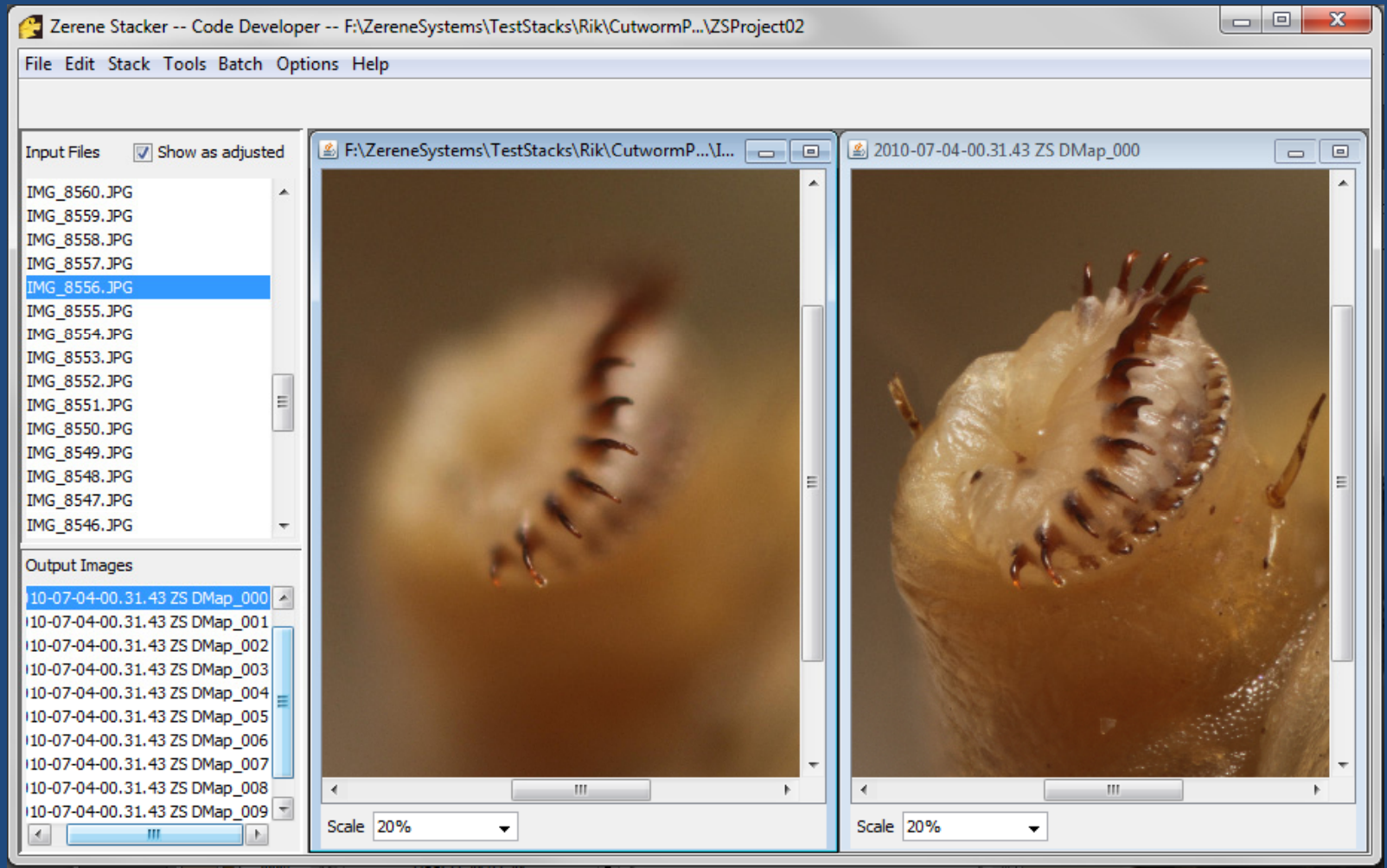
What Else?

- What focus stacking is
- Why we have to do it
- Why diffuse illumination is important
- Stop down as far as sharpness allows
- Try multiple stacking methods
- Expect to use retouching for best results
- Consider stereo or animated rocking

Synthetic Stereo & Rocking

Zerene Stacker

optimized for high magnification and tough subjects,
includes synthetic stereo & rocking from single stack



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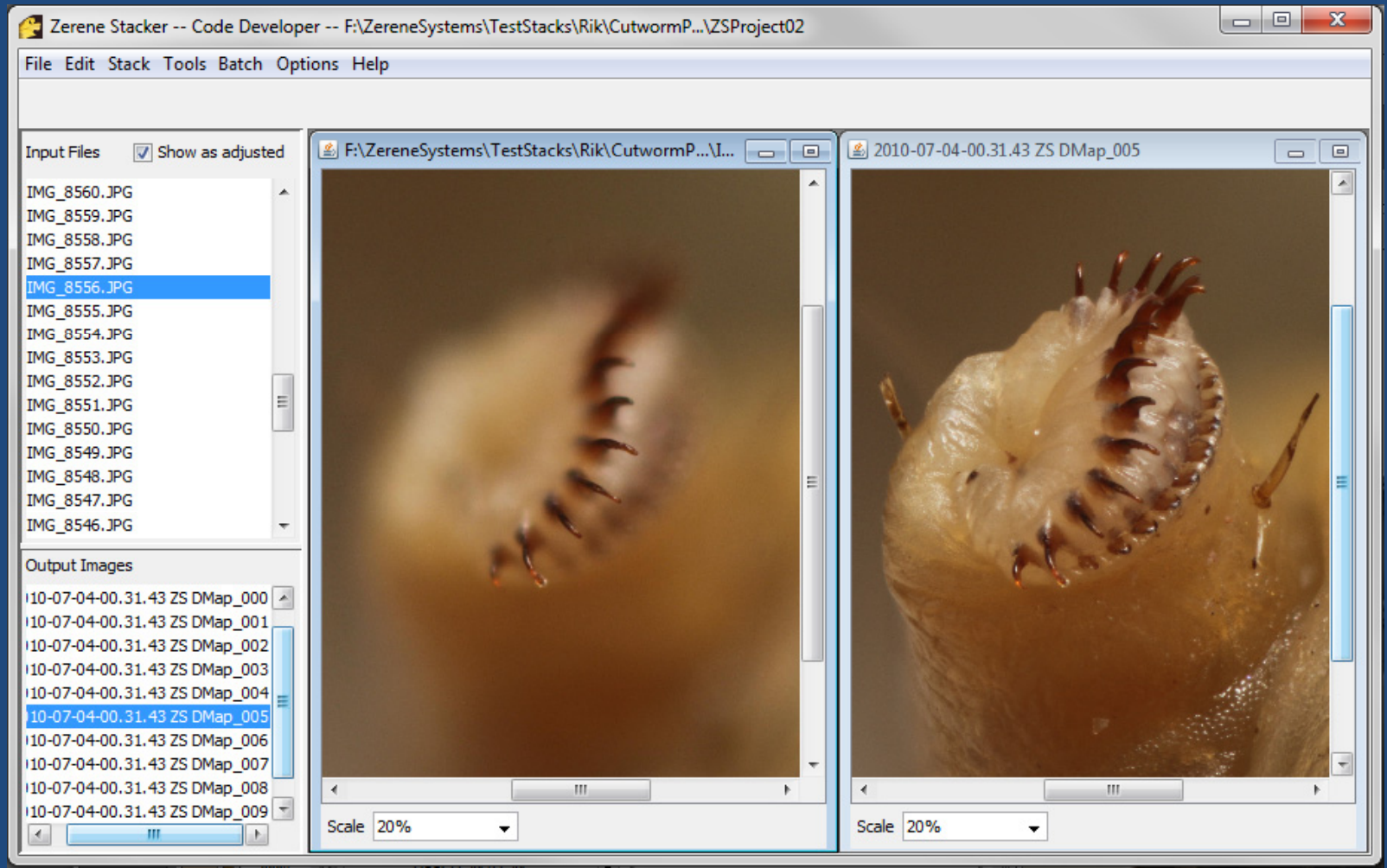

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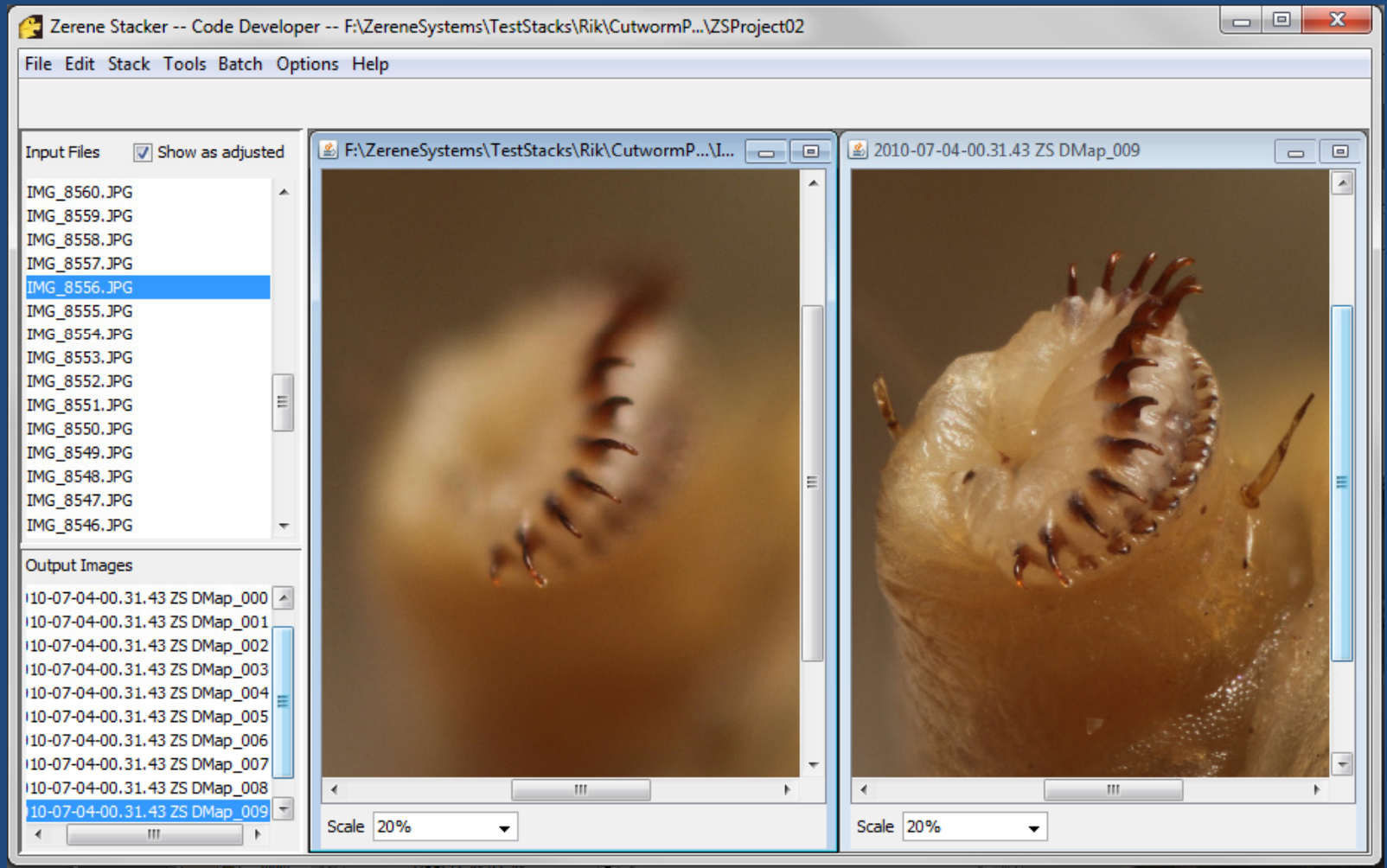

One Last Image

Source: USGS Bee Inventory and Monitoring Lab

https://www.flickr.com/photos/usgsbiml/15937442181/in/photostream/

Velvetbean caterpillar, *Anticarsia gemmatalis*

Contact Info

Rik Littlefield -- “The Zerene Stacker Guy”

Email: support@zerenestacker.com

Forum: http://photomacrography.net

Cell phone: 509-521-6860

(the end)