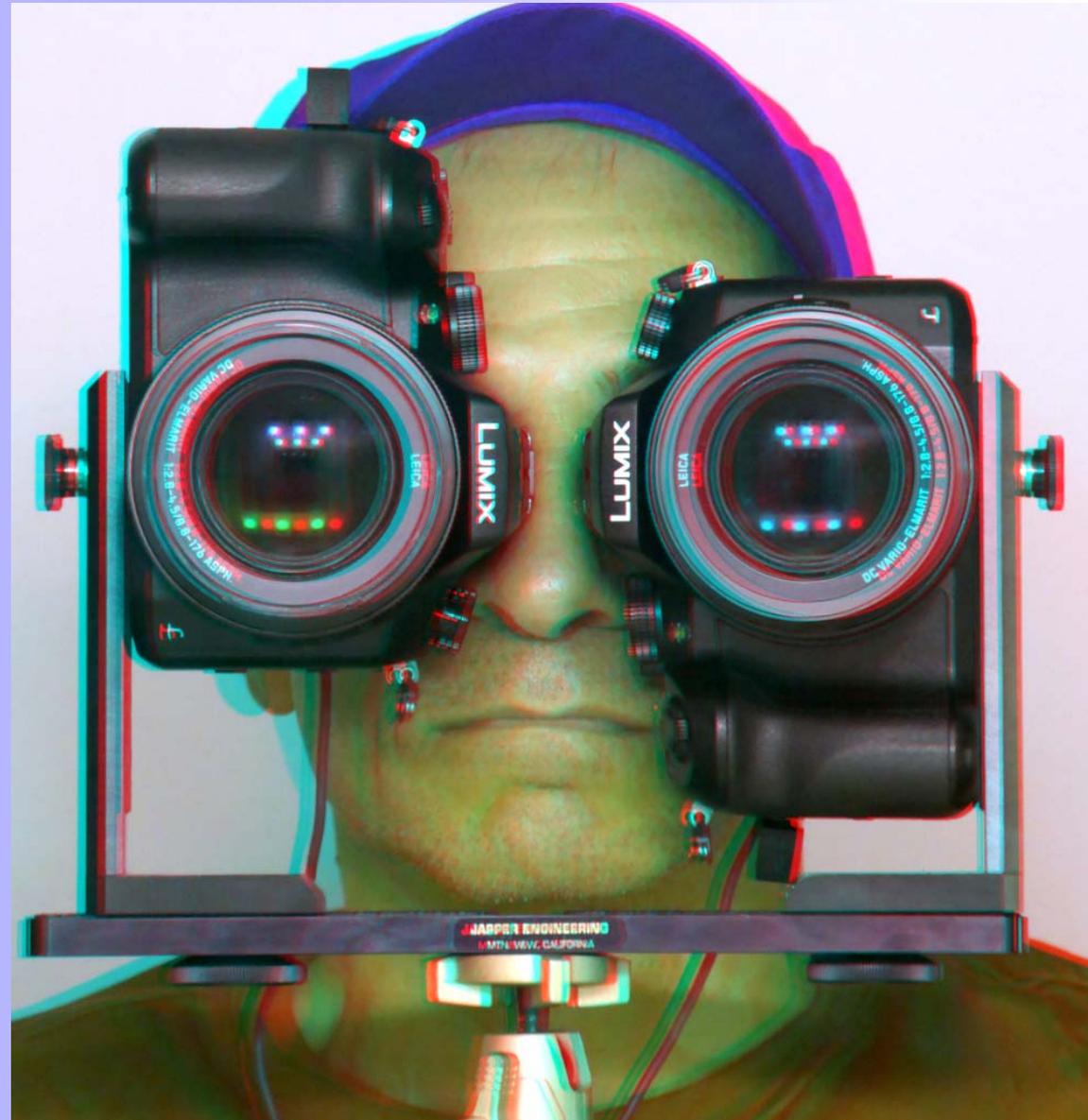


How to Take

Close- Ups in 3D

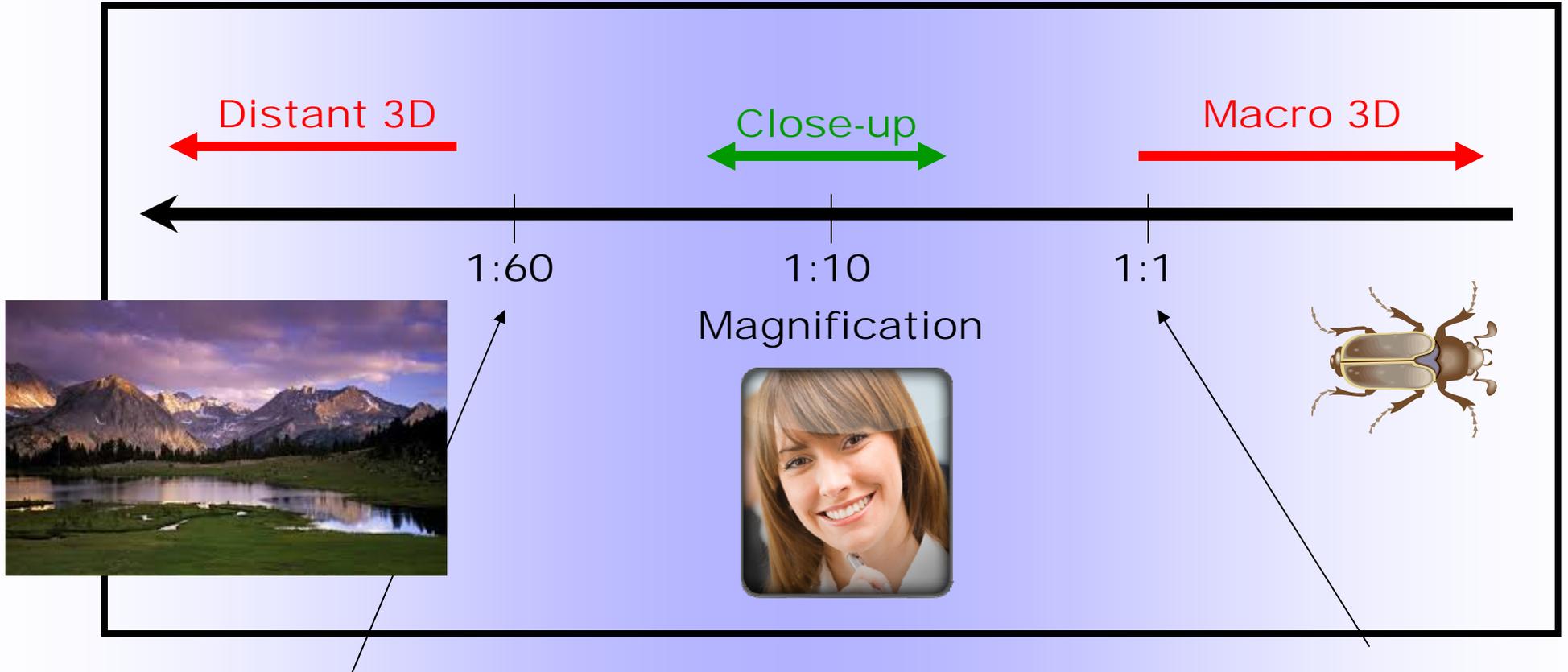
By George Themelis
OSPS February
2021



Outline

- **Why?**
- **The Challenges**
 - **2D** (how to achieve the magnification)
 - **3D** (how to control the deviation)
- **Equipment & Techniques**

What is a close-up?



Traditional Distant 3D photography:

Normal photography when the near object is at 2.1m (7 ft) from the camera. $M \sim 1/60$

Traditional Definition of Macro:

Anything with magnification of **1:1 or larger** (or object size 24mm in height or smaller)

Close-up Challenge

2D	3D
<p data-bbox="348 704 825 776"><u>Magnification</u></p> <p data-bbox="359 821 814 885">FL / Distance</p> <p data-bbox="201 1057 974 1214">Get closer to increase the magnification</p>	<p data-bbox="1356 704 1692 776"><u>Deviation</u></p> <p data-bbox="1253 821 1797 885">Base / Distance</p> <p data-bbox="1129 1057 1919 1214">Reduce stereo base to keep deviation small</p>

Summary of Equipment for Close-Up

Method		<i>B</i>		
1. One camera and shift		0-inf	X	X
2. 3D camera		50-75mm	X	
3. Close-up 3D camera		20-40mm	X	x
4. 3D Camera + attachment		~30mm	X	x
5. 2D camera & 3D lens		10-15mm	x	X
6. Two 2D cameras & mirror (Macrobox)		0-50mm	X	X
7. Two 2D cameras + long lenses		100-150mm	X	x

1. One camera & shift

Easiest & least expensive (phone, even a stereo camera!)

How to do it: **Picture 1** → **shift** → **Picture 2**

Advantage: **Flexible stereo base**

Drawback: **For stationary objects only**

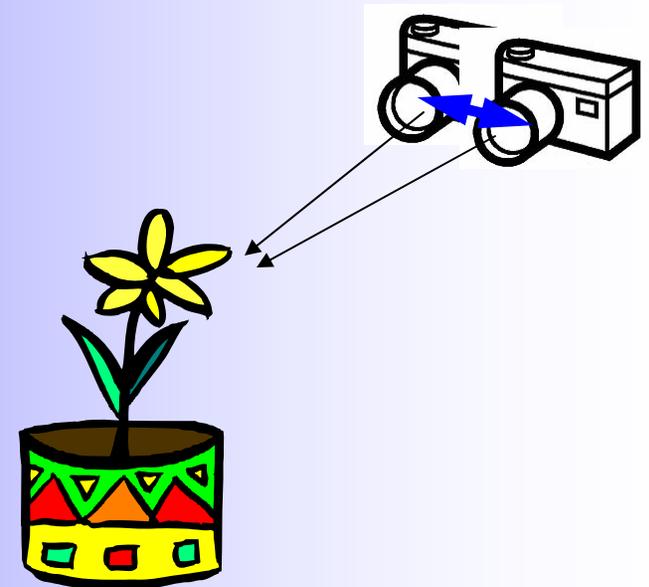
Recommendation for Stereo Base:

~ 1/20 x Distance to Nearest Object

Slide Bar or free held? With SPM, free-hand is OK

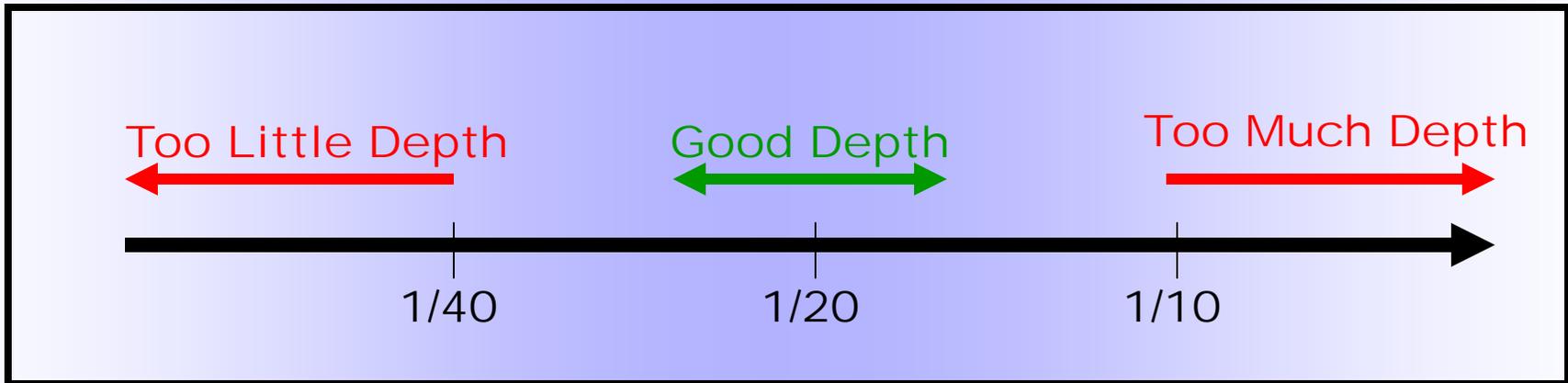
Converge or not? It is OK to converge to save image width

Flash? Do not shift flash if shadows are formed

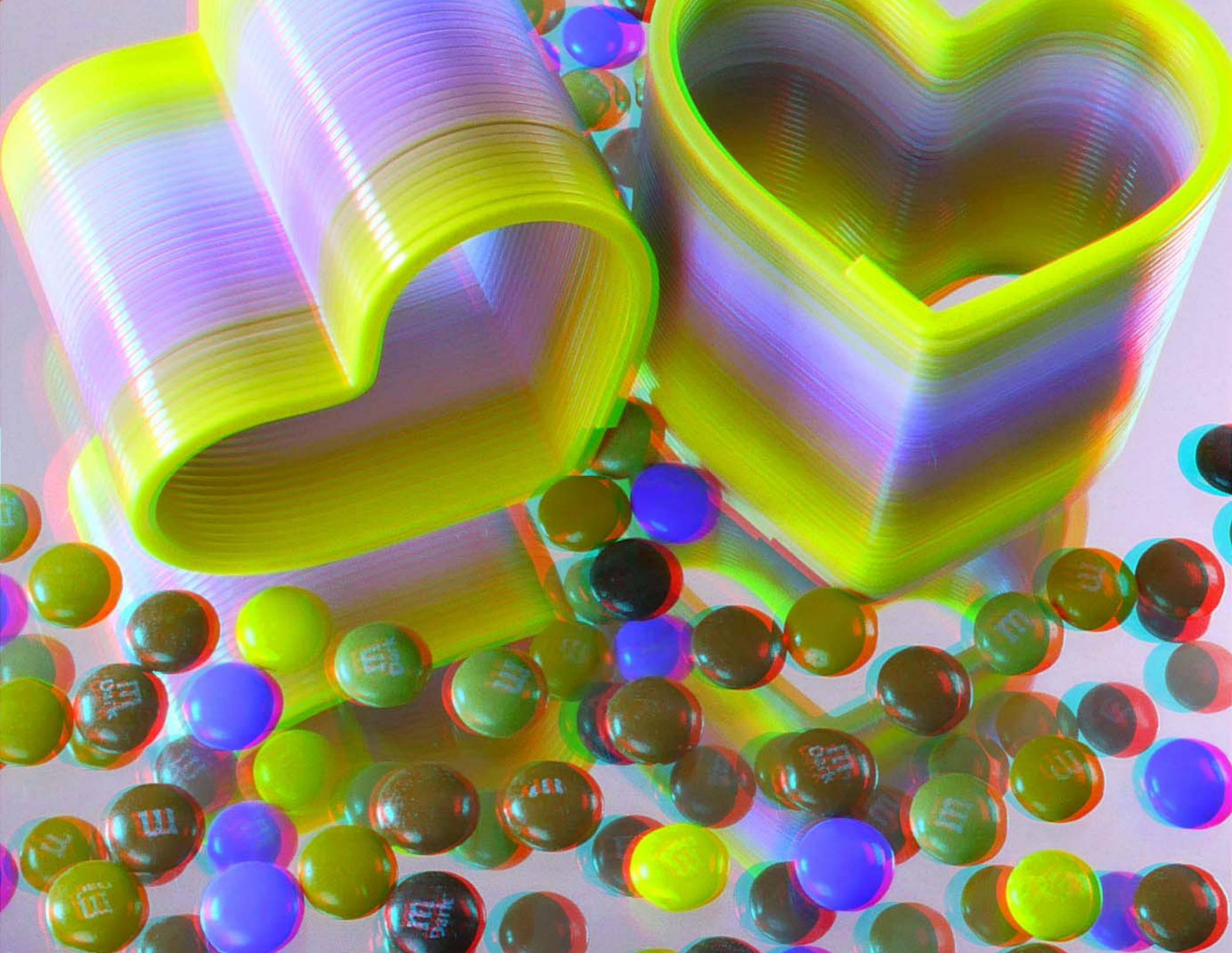


Depth Ratio (B/I)

Stereo Base over Distance



- Both the Stereo Base (B) and distance (I) are very important in 3D photography, but **it is the ratio of B/I that determines the amount of depth in the picture**
- For distant 3D photography traditionally a **ratio of 1/30** is recommended.
- Through trial and error, I have found that a **depth ratio of about 1/20 works well for close-ups**



Iphone cha-cha



Fuji W3 in Advanced 3D mode



2. Standard 3D Camera



A standard 3D camera (B ~ 60-75mm)
can be used for close-ups

if the background is blocked

Instead of coming closer, it is better to:

Stay back and zoom-in

The Background is the
ENEMY of close-ups

How to control/eliminate the background:

- **Use a physical barrier**
- **Use a featureless background**
- **Throw it out of focus**
- **Use strong flash** (darkens the background)
- **Photoshop** to the rescue

Barb Gauche





3. Close-up 3D camera



Panasonic Lumix 3D1



Horseman 3D



Macro Realist



Variety of 3D video digital cameras and phones, etc.



B = 20 - 30 mm



Nimslo with close-up lenses

Panasonic Lumix 3D1



Question: Given the distance of the lenses B , how close can you get to your subject for a good close-up?

Answer: $l \sim 20B$

Panasonic: $B=30\text{mm}$, $l \sim 600\text{mm}$ (24 inches, 2 ft)

This is approximately the distance of the extended hands

Lumix 3D1



Selfie w/ Lumix 3D1



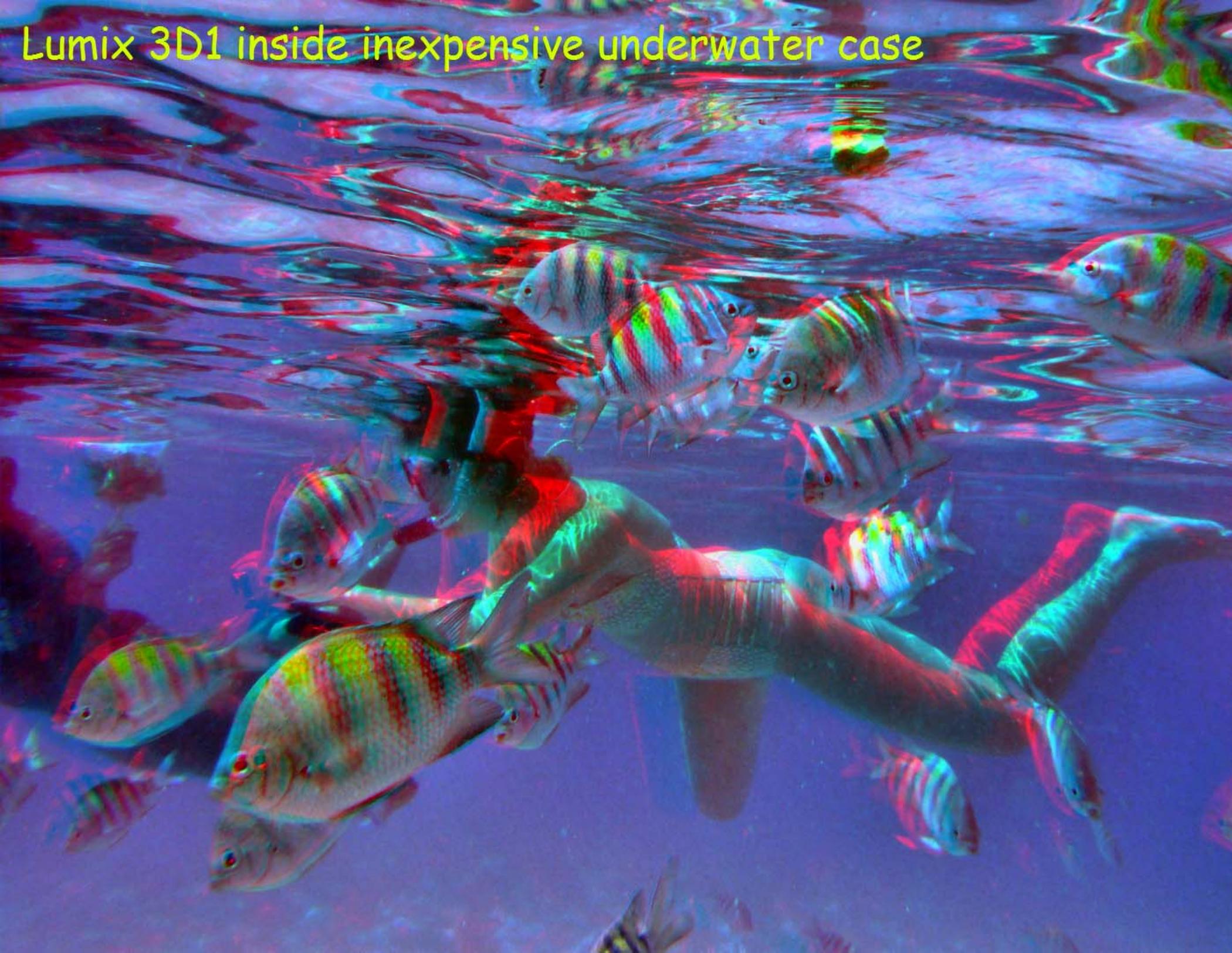
I ~ 0.6m

D ~ 1/6

Selfie with
the Fuji W3



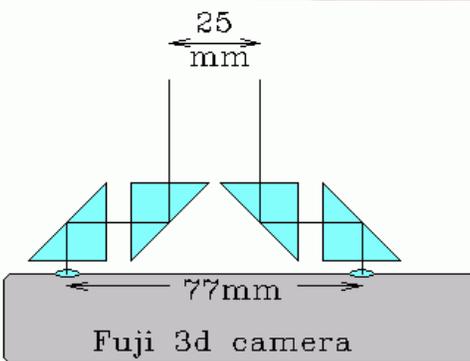
Lumix 3D1 inside inexpensive underwater case



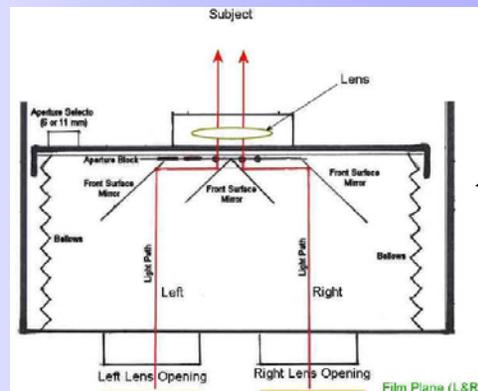
4. 3D Camera & Attachment



- Use mirrors or prisms
- Redirect light & effectively reduce the spacing of the lenses



Cycloptial 3D attachment
for the Fuji 3D camera



RBT macro attachment
for RBT cameras



Cyclopital 3D & Fuji W3 (zoomed)

RBT macro
by Dale Yingst



D ~ 1/40

5. 2D camera & 3D Lens

One camera lens with two lenses, records side-by-side stereo images that share the same film / sensor area



Kindar/Hyponar Lens



DeWijs Lens



<https://www.dewijs-3d.com/>



Panasonic 3D Lens



Loreo 3D Macro Lens



Custom lens by Oktay Akdeniz

Panasonic 3D Lens

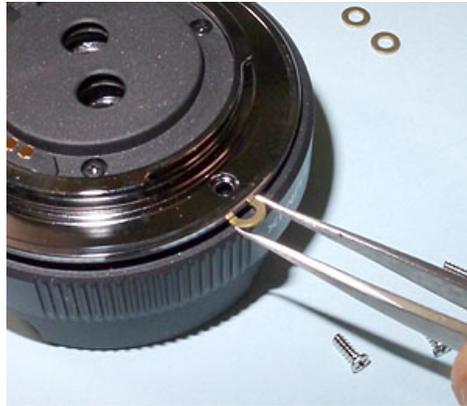


- **Micro 4/3 mount lens**
Produces a 3d (MPO) file in certain (all recent) micro 4/3 cameras by Panasonic and Olympus
- **Two lenses, 10mm apart**
- 12.5mm FL, f12 fixed aperture, **fixed focus**
(Range: 0.6m-INF, estimated focus at 0.9m)
- **Not good for general 3D photography**
($D = B/l = 1/90$, extremely weak depth)
- Good for macros
but needs to be modified to focus closer

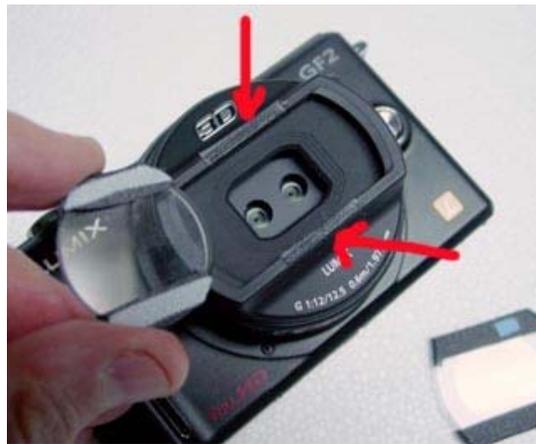
Panasonic 3D Lens Modification

Modifications to focus closer (increase magnification)

Extension



Close-up Lenses



Panasonic 3D Lens & CU lenses



How to Attach:
Velcro
Special attachment

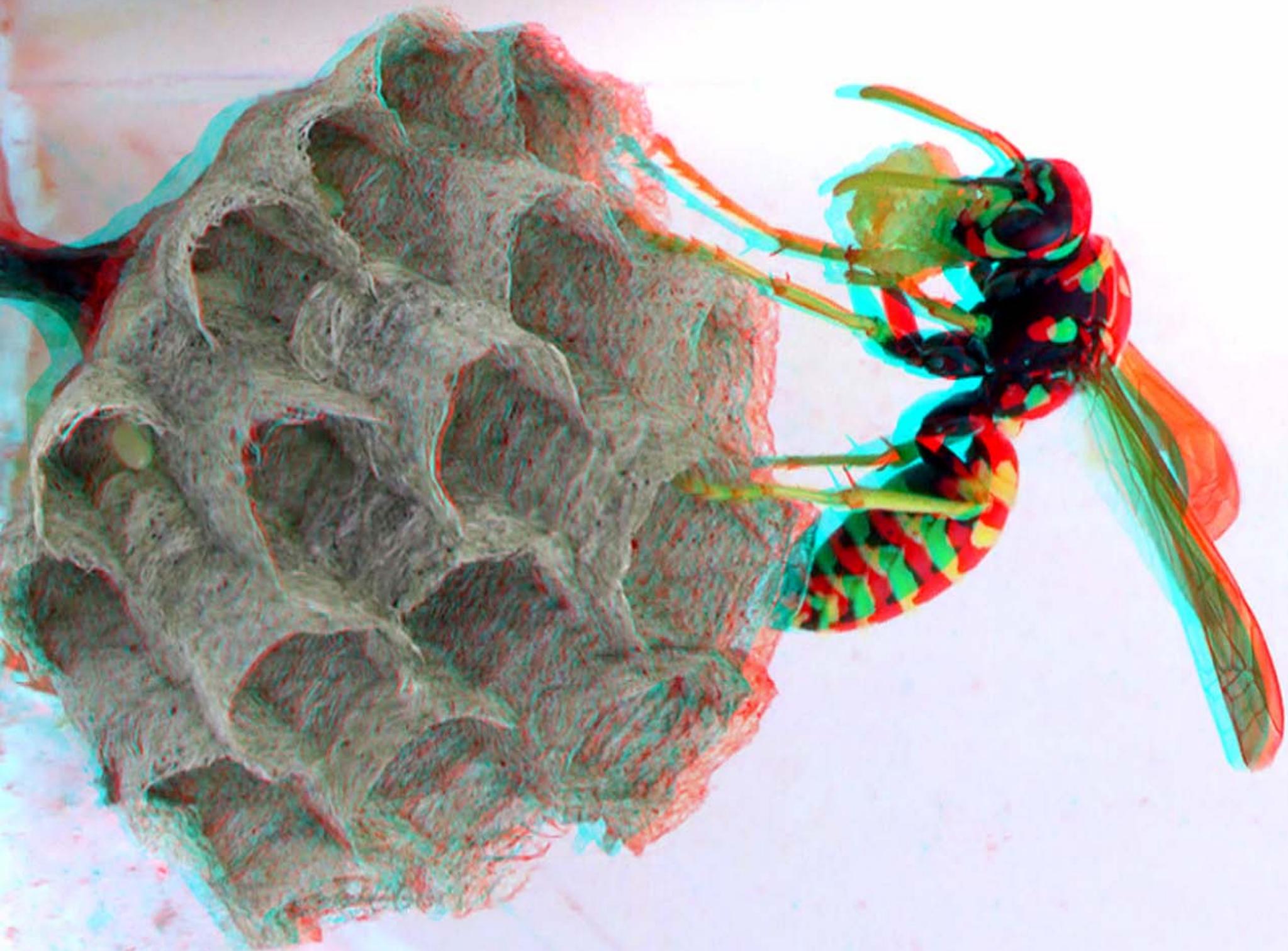
Strength of CU lens: (+1, +2, +4)

Diopter = 1000mm/FL



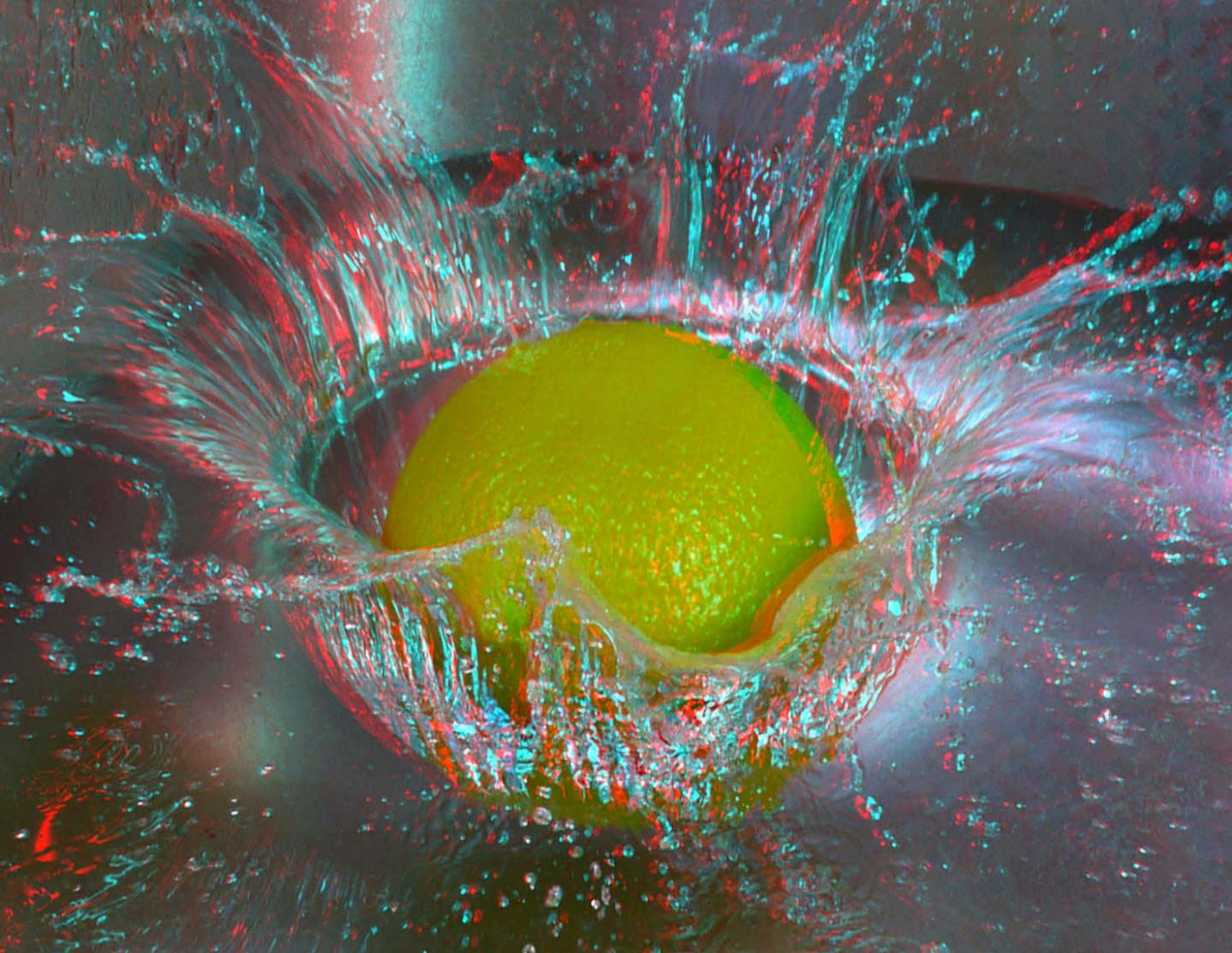
Achromatic CU lenses (+3, +5, +10)

Recommended for anything higher than +1



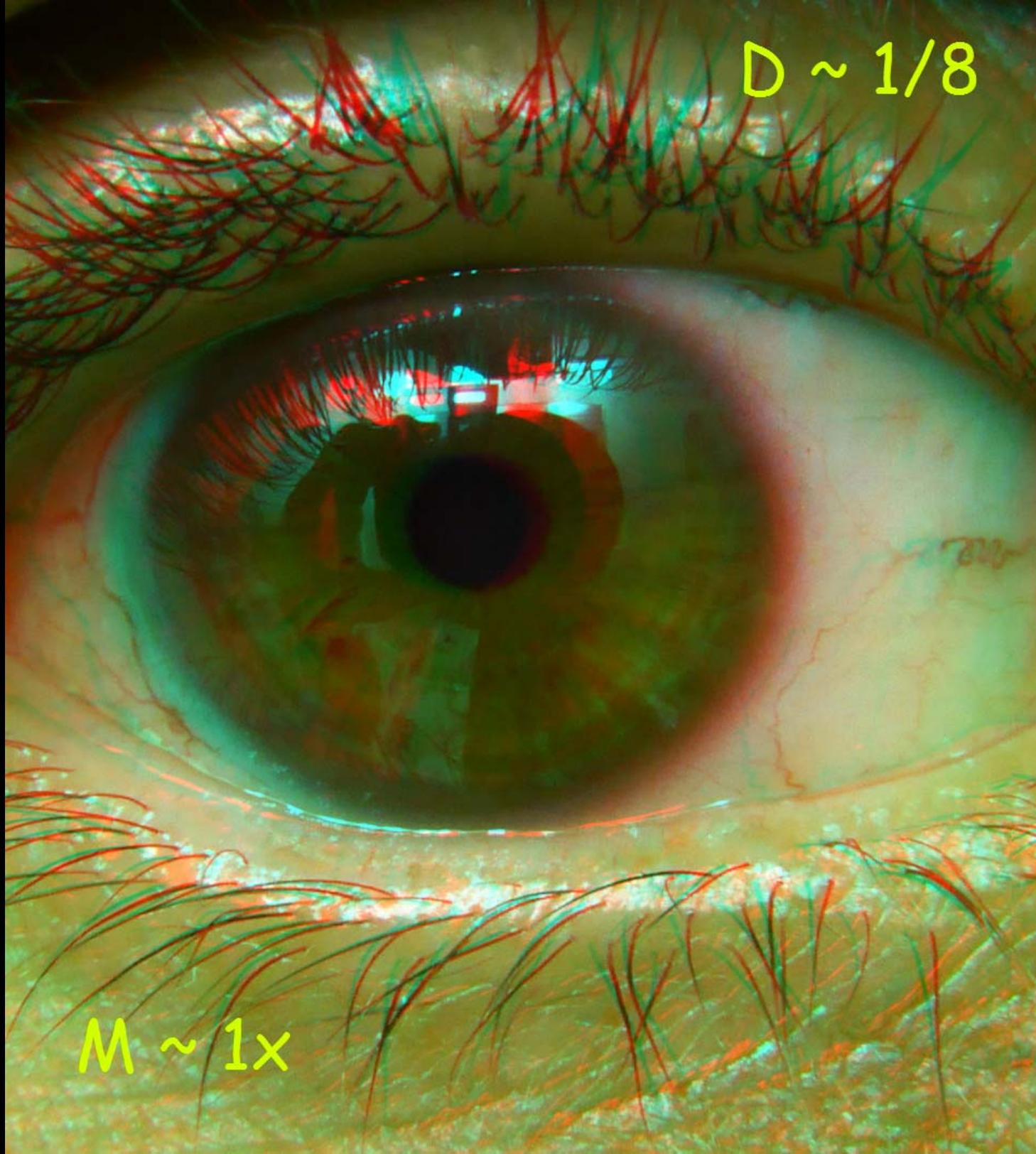
1mm ext (D = 1/15)



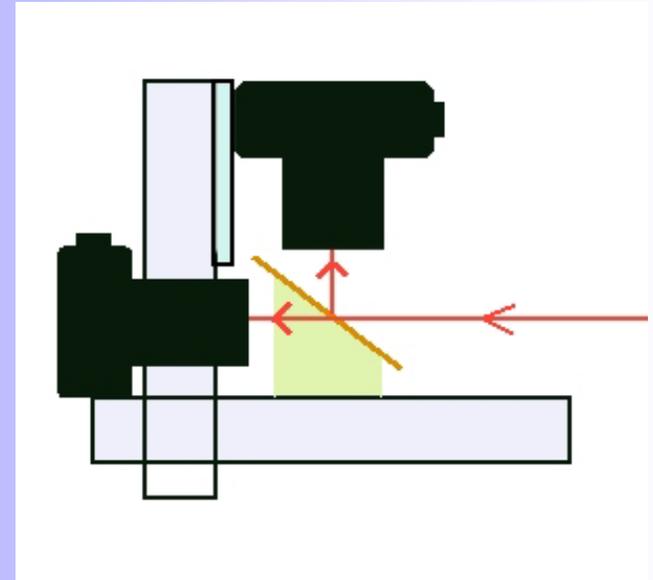
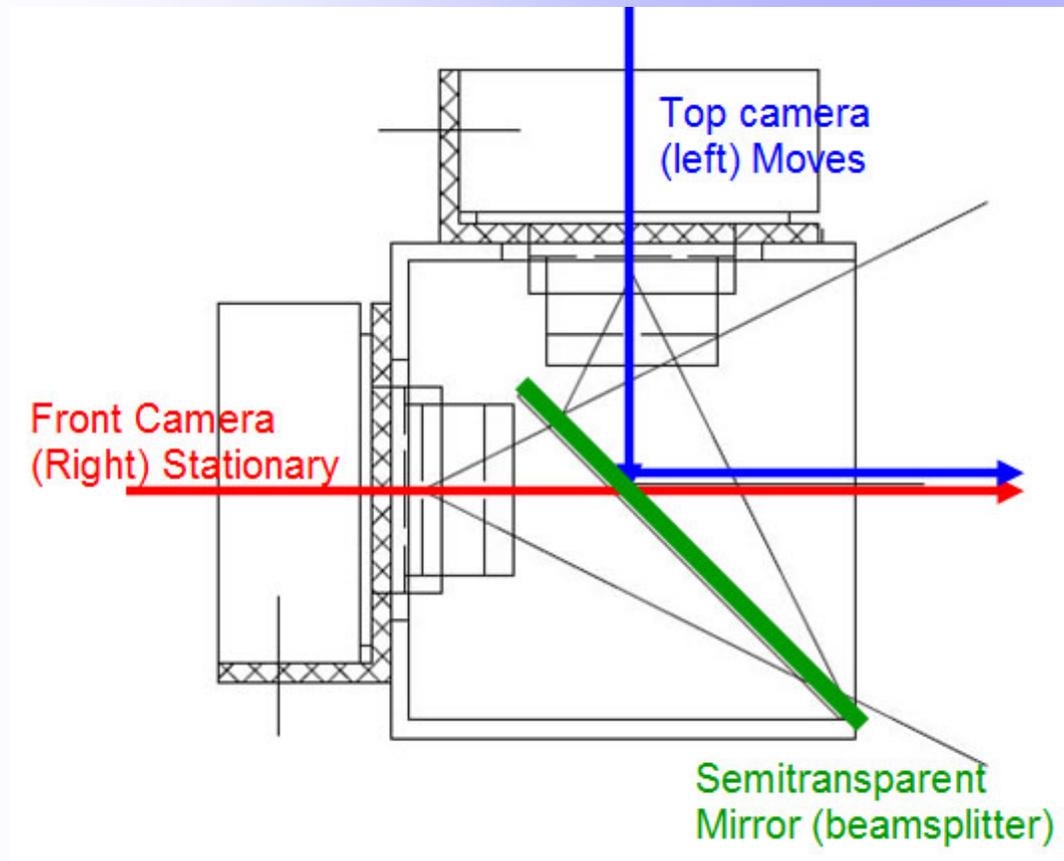


$D \sim 1/8$

$M \sim 1\times$



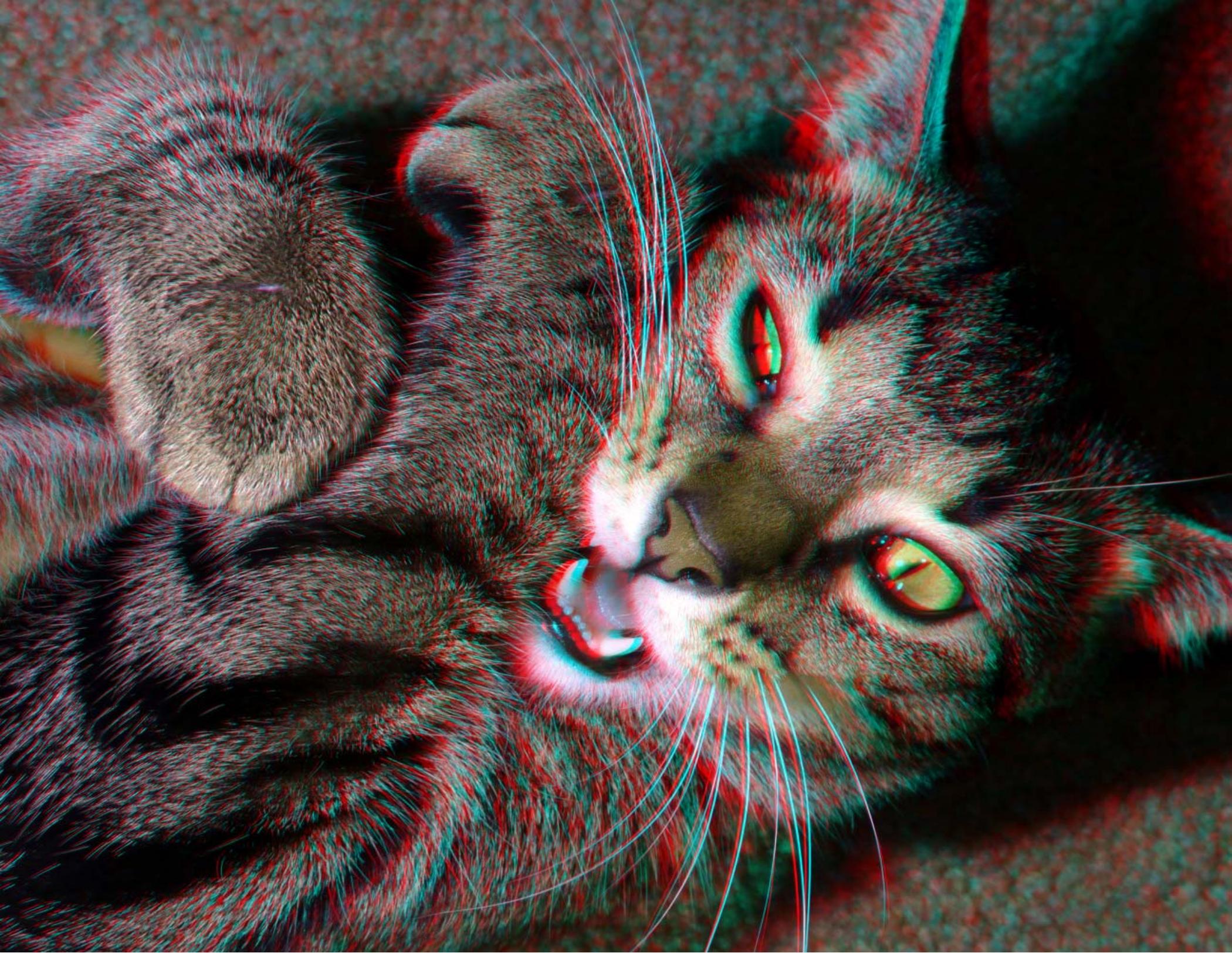
6. Two cameras & mirror



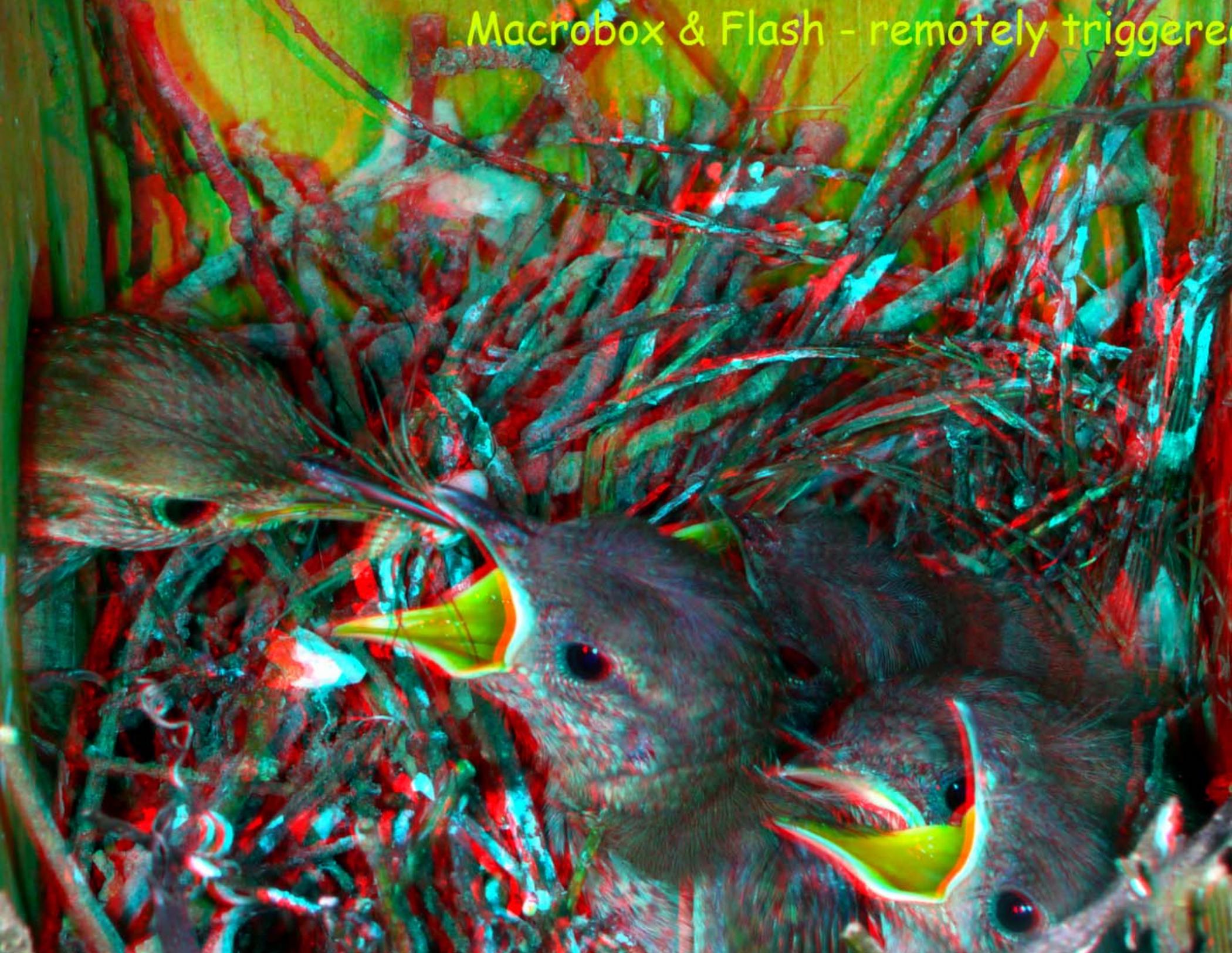
Macrobox for Canon SDM cameras—Features:

- Adjustable stereo base from 0mm to 50mm
- Filter threads in cover allows to use filters
- High-quality half mirror w/ anti reflex coating
- Made out of lightweight but stable plastic
- Cost ~ 450 Euros

<http://www.digi-dat.de/>



Macrobox & Flash - remotely triggered



7. Twin cameras & Long lenses



**Panasonic bottom-to-bottom
w/ Olympus lenses 75mm lenses**



**Samsung side-by-side
w/ 500mm mirror lenses**



Panasonic TZ80 (24-720mm) side-by-side



Panasonic FZ2500 (24-480mm) bottom to bottom (left) and top-to-top (right)



**Canon 6D with 100-400mm lenses
top-to-top**

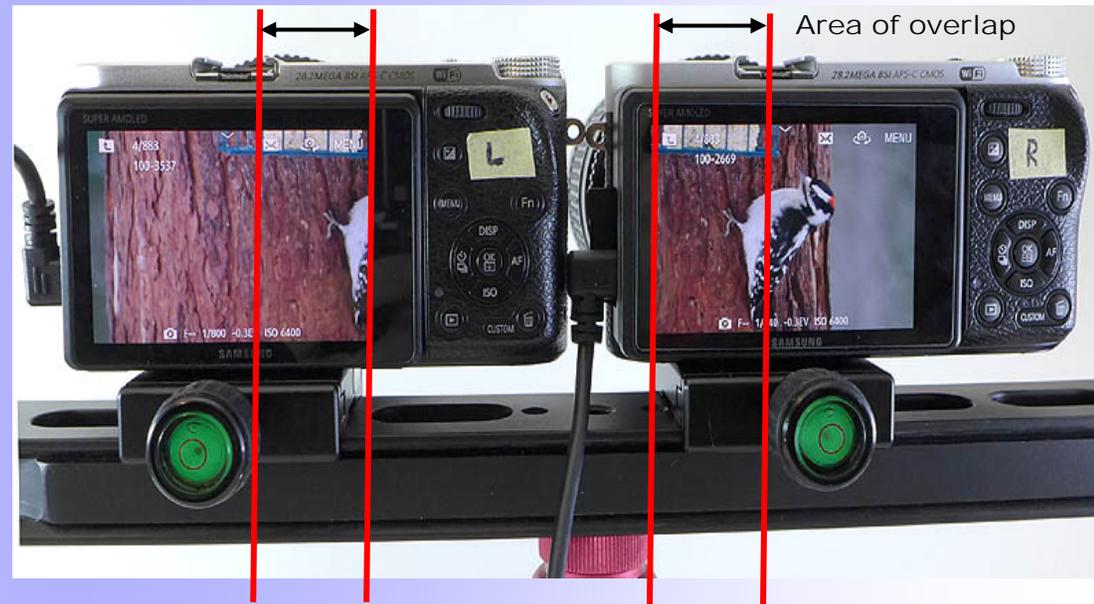
Issues when using Twin Cameras w/Long FL Lenses

Alignment - Focus - Synch

Vertical Alignment



Horizontal Alignment



If the cameras are pointed parallel, there will be partial Image Loss (= $M \times B$) **The lenses must converge!**

Different Camera Mounting Configurations

1. Horizontal (side-by-side)

- Works ok for smaller cameras
- Flexible stereo base for hypers
- Not easy to use w/ large cameras on the field



2. Vertical

- **Portable** - can be held with a grip or monopod
- **Easier Vertical Alignment**
- **Easy to convergence**
- **Smaller stereo base**
- **Top-to-top: Use VF for 3D viewing**
- Vertical orientation not best for 3D



Jasper Vertical Mount



Panasonic GX7 & 300mm



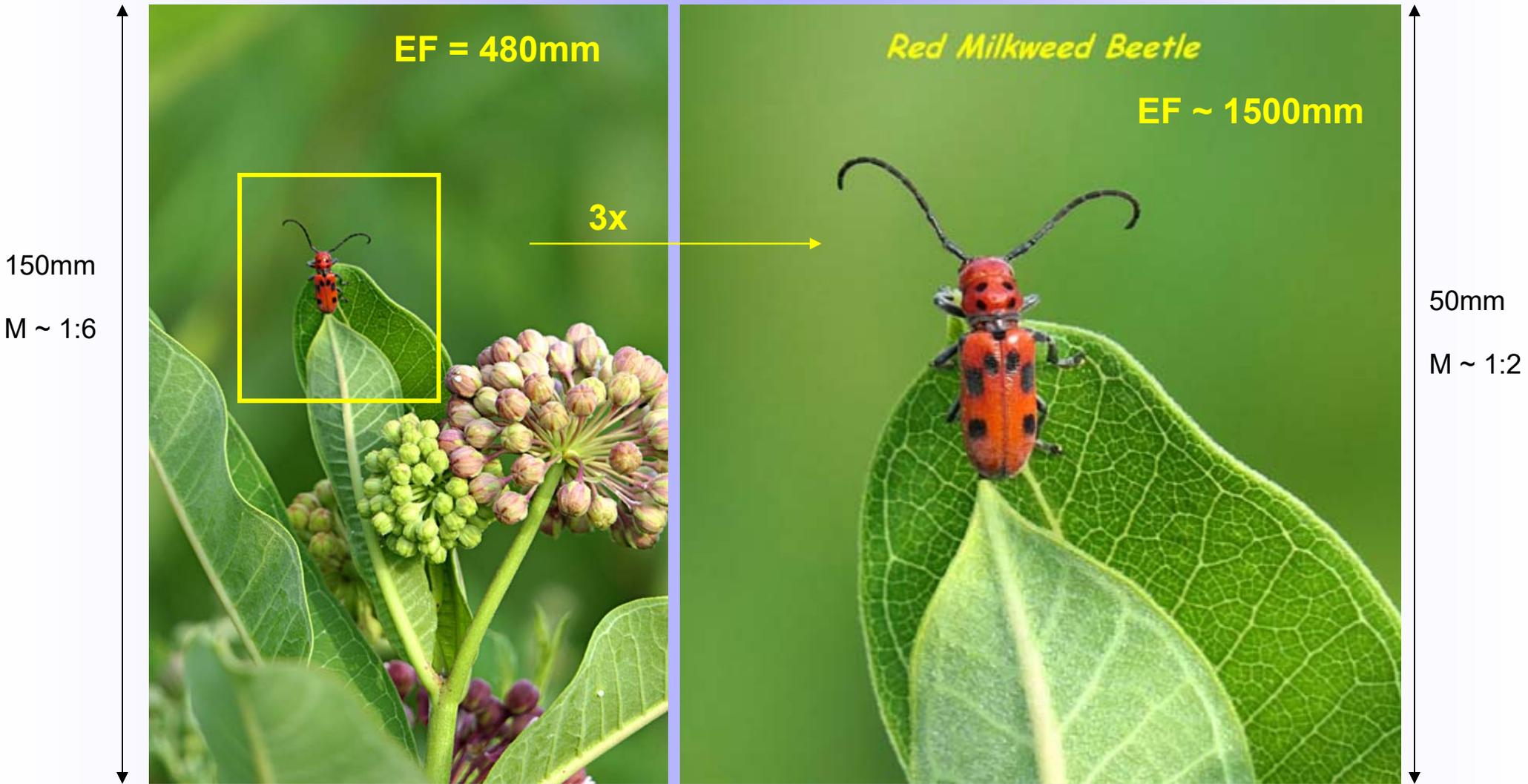
Twin Sony RX10







Panasonic FZ2500



Distance ~ 2m (D ~ 1/15)

Summary of Equipment for Close-Up

1. Single 2D camera

Shift



3D lens



2. Stereo camera

As is or shift too (Fuji A3D mode)



Close-up 3D camera



Attachment for 3D camera



3. Pair of 2D cameras

As is w/normal lenses (if B is small)

Mirror/prisms (Macrobox, etc.)



Long lenses (& large B)



Similarity Principle

You can take a close-up with:

- Normal/wide lenses by getting closer (I, II)
- Longer lenses from a longer distance (III)

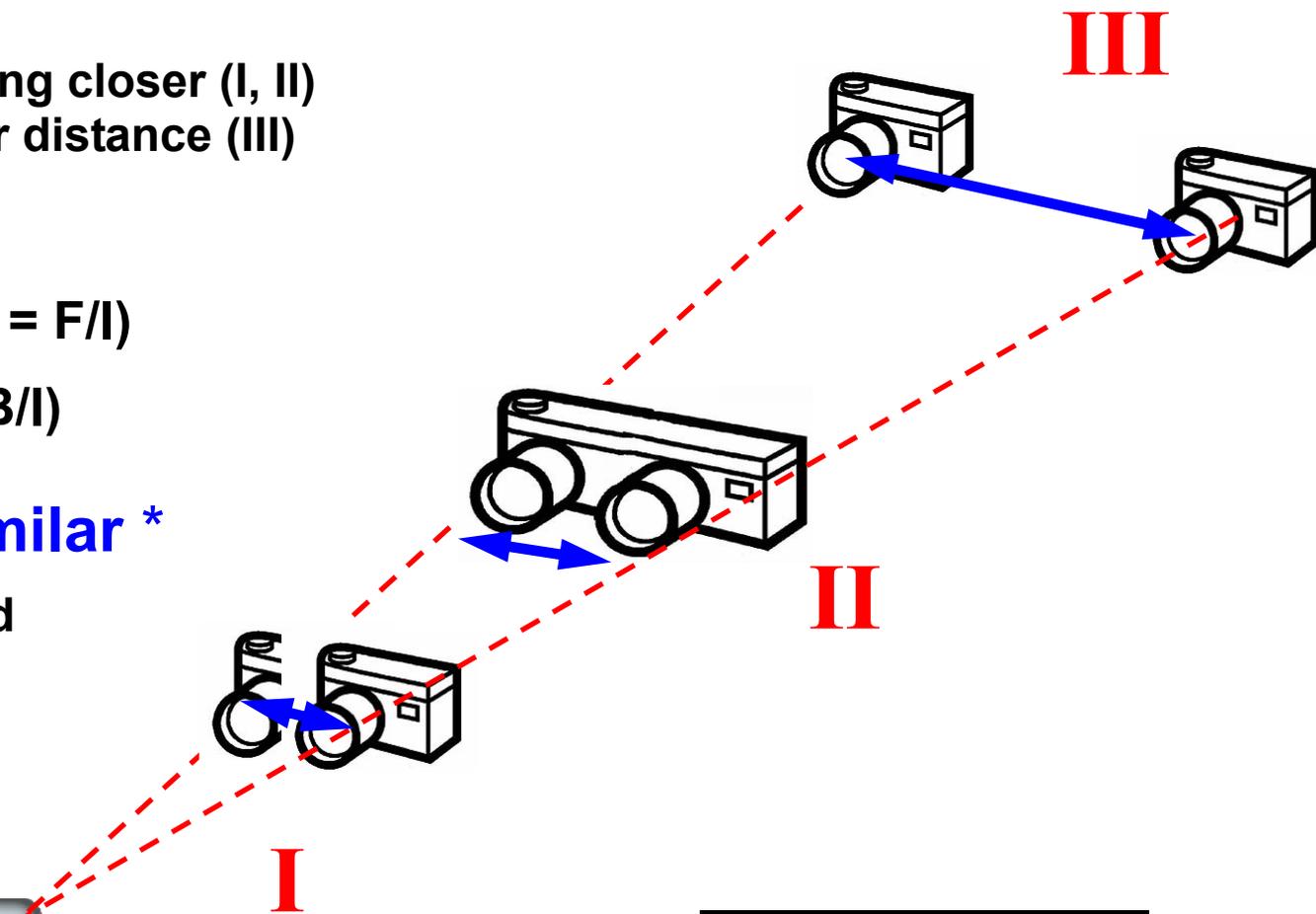
Pictures that have:

- Same **magnification** ($M = F/l$)
- Same **depth ratio** ($D = B/l$)

Look surprisingly similar *

if the background is blocked

if the background is blocked



Recommended $D = B/l$

~ 1/20

* **Similar** = same size, same stereoscopic deviation but different perspective (ratio of size of near to far object)

Summary

- Close-ups are very **effective** in 3D
- **2D Challenge**: Achieve the magnification
- **3D Challenge**: Control the deviation
- Recommendation: **Stereo Base / Distance ~ 1/20**

Equipment:

- For starters use a **single camera**
or a **stereo camera** (stay back and zoom in)
- The **Panasonic 3D1** (B=30mm) is good close-up stereo camera
- The **Panasonic 3D lens** (B=10mm) is a good way to experiment with close ups.