

Cropping

For Better 3D Pictures



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Slide Film Masking



Film masking = using mounts with smaller openings or overlapping masks or using aluminum tape we **eliminated parts of the image,**

Digital Cropping

Digital Cropping = we are able to quickly crop images in all 4 directions (up, down, right, left).

Digital cropping removes pixels, but the image is rescaled to fit the screen, so it doesn't get smaller. On the contrary, **cropping is a way to make the main subject look larger.**

Digital cropping is, IMO, one of the most powerful tools that digital photography has to offer

Cropping

- Remove distractions
- Focus on your subject
- Improve composition

- How is cropping done?
- Limitations / Pitfalls of cropping

- Change **Aspect Ratio**
- Increase **Magnification / Focal Length**
- Change **Stereoscopic Deviation**

- “**Extreme Cropping**”
Find a subject within a subject

The concept of cropping applies equally to both 2D and 3D photography. This is the only topic unique to 3D photography

Distraction

The eyes are drawn to bright objects, the rock here, and are led out of the picture

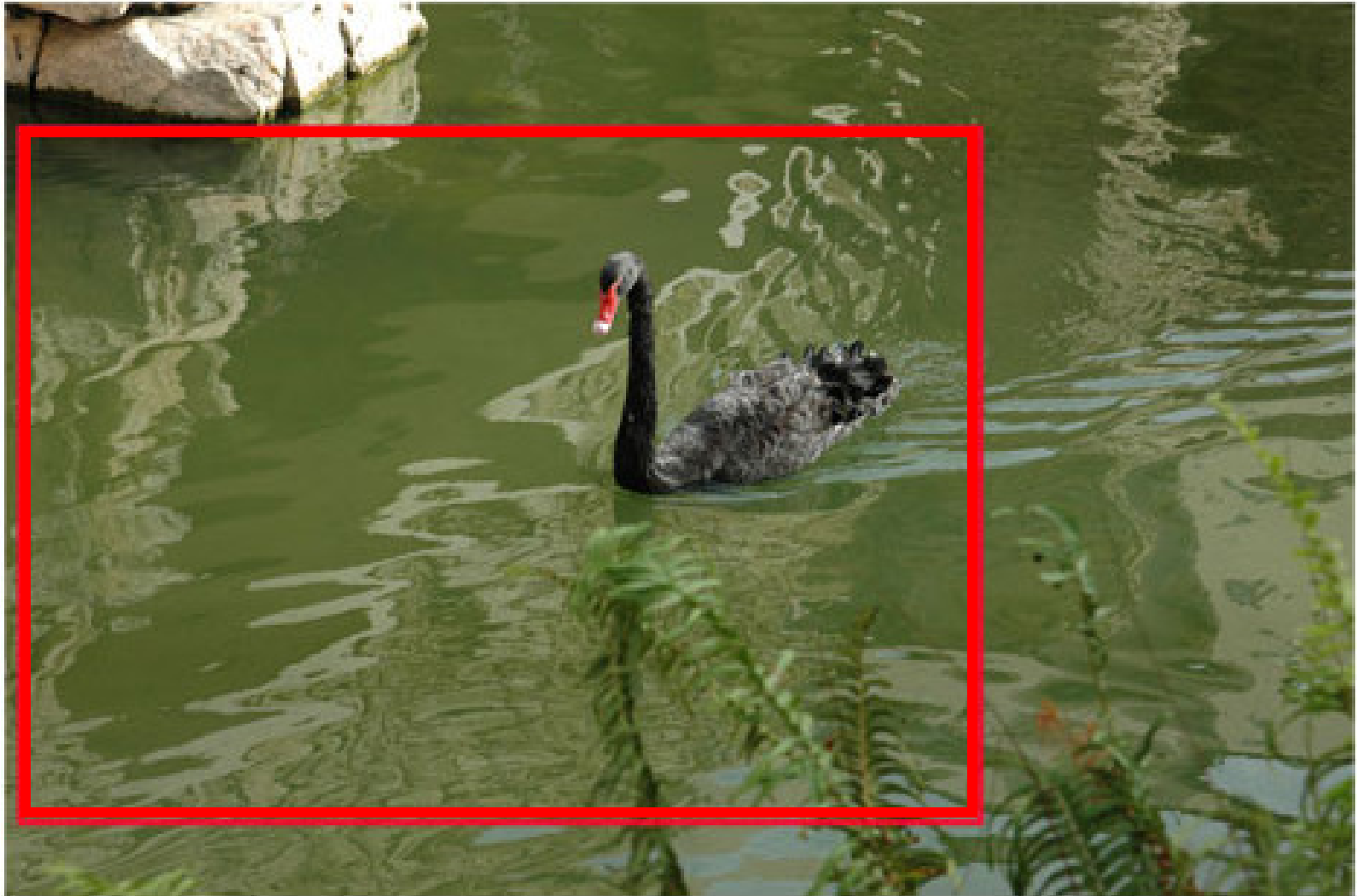


Example of an image that can be improved with cropping



Main subject is centered

Possible Cropping



After Cropping:

Distraction removed & composition improved



Example (George & Liz with Running Medals)



I gave my Panasonic 3D1 camera to a friend to take a picture of Liz and me.

Classic composition error by beginners: Camera aimed too high which put the faces near to the center, leaving a large space at the top and cutting our feet.

The white towel is also a distraction.



After cropping: The distractions are removed, the composition is improved, and the main subjects (us!) look bigger

Example (Baby Theo)

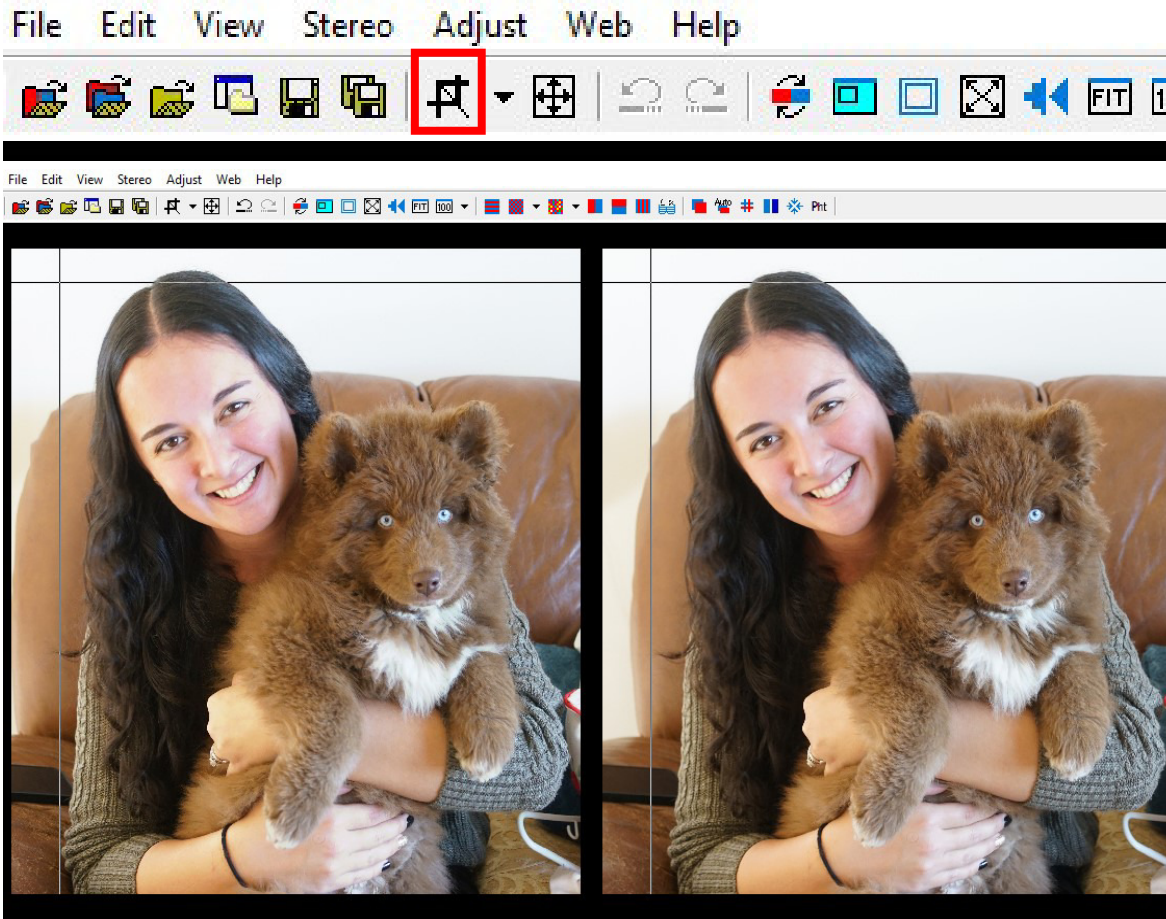


Original: Composition is OK, but there are distractions (bright toys, cut by the frame) on the left side.



After cropping: The distractions are removed, and the main subject looks bigger

How to crop using SPM



- Select the **crop sign** or **press **
This creates a pair of cross hair lines that move around as you move the mouse.
- **Select one corner** of the cropping area, say top left. **Press and hold the left mouse button and move to the opposite corner** (bottom right).
- **Release the button.** You now have the cropping area outlined. At this point **you can still move the cropping area around by pressing and holding the left mouse button.**
- **The instant you release this button, the image will be cropped.** It takes a few tries to master this.
- If you make a mistake, hit the **UNDO button** (or press **<Ctrl><Z>**) and try again.

Useful SPM Shortcuts For Cropping

Key	Function
	Activates cropping
<ESC>	Cancels cropping
<F>	Adjusts image to fit the screen
<J>	Blows up image to 100%
<Ctrl><Z>	Cancels the last action (cropping)

Use the Mouse: Press & hold the Left Mouse Button to move the image around. Turn mouse scroll wheel to increase/decrease image size

Composing / Cropping Portraits

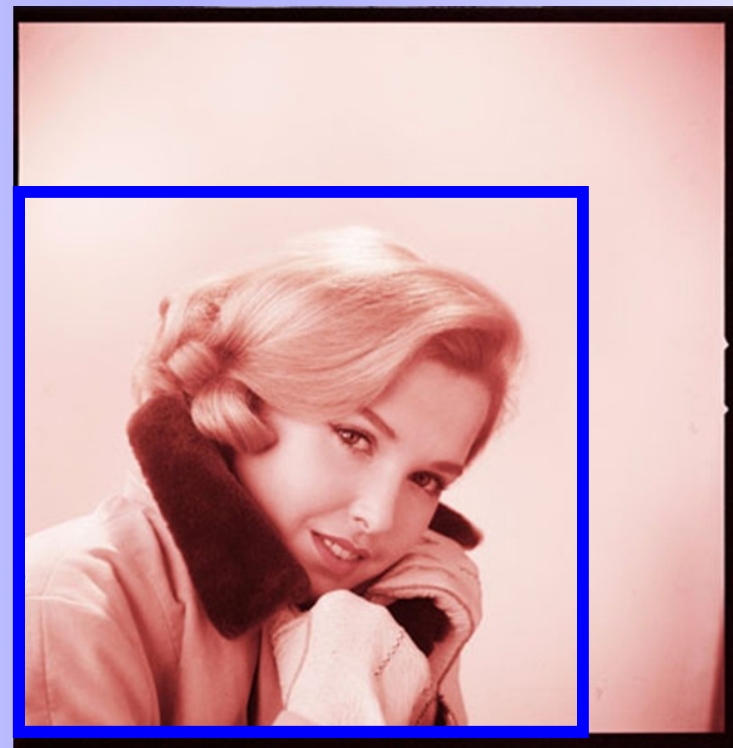
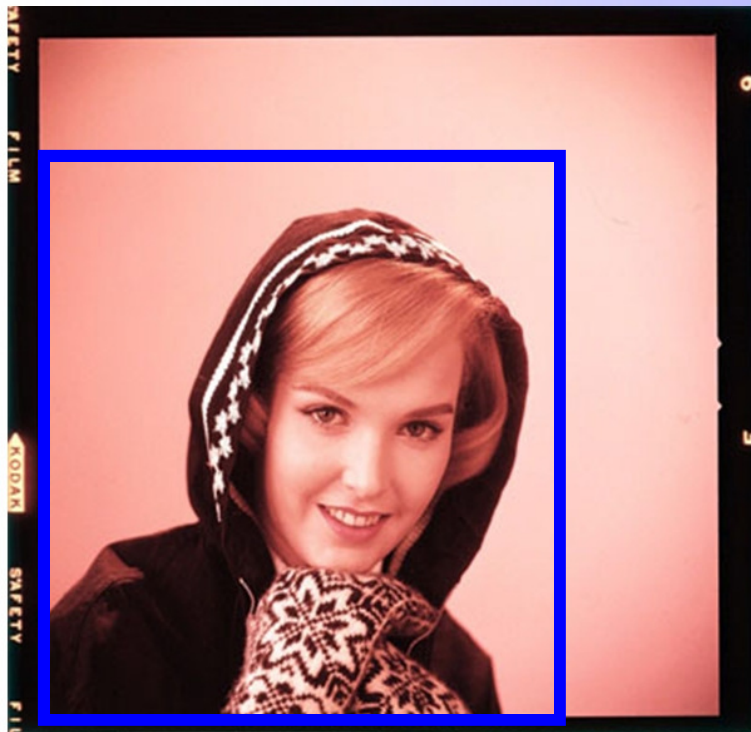


- There is natural tendency to frame a face by putting the eyes at the center.
- A better composition is **having the eyes in the upper 1/3 of the frame, looking into the picture**

Random Ebay find: Medium format slides / portraits, all ill-composed



Proposed Cropping (too bad these are slides and not digital images)



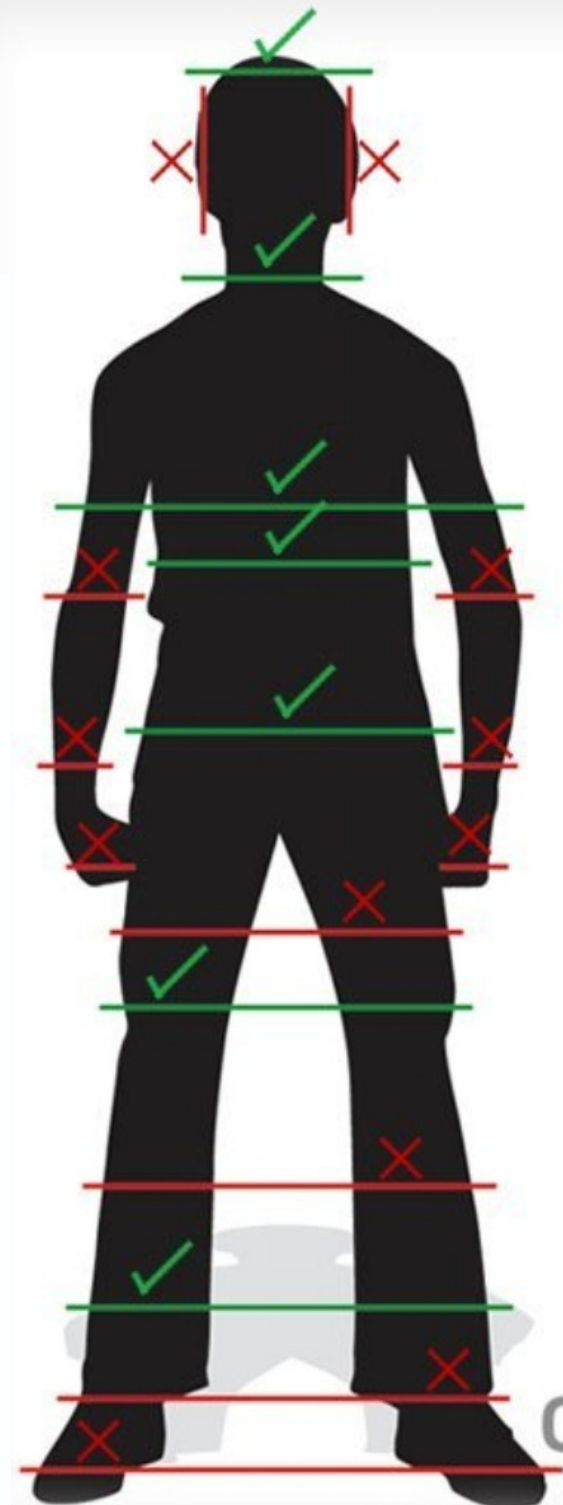
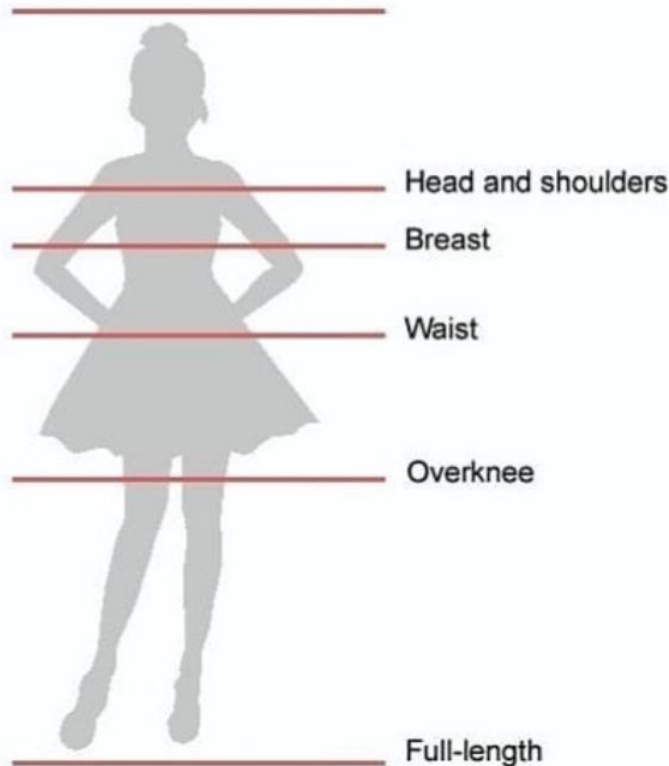
Cropping Rules

PHOTOGRAPHY TIPS

Framing portraits

- Don't crop off the joints.

- When framing the head crop the top off almost to the brows.
- Waist up portraits are better to be shot from the waist level.
- Head and shoulders - from the breast level.
- Close up - from the eyes level.



Example (Young Musician)



Original: Too tight at the top, cuts the ankles (a joint) at the bottom.

Advice: **Do not compose too tight.** You cannot bring back things you did not record but you can always remove things you do not want.



Cropped: Further cropping improves the composition, in my opinion. The cut now is below the knees, which is acceptable. The tight top is not as distracting because now this is a close-up.

Limitations / Pitfalls of cropping

- Cropping **reduces image resolution** (not a problem in 3D, there is usually plenty of resolution for our viewing methods)
- Cropping can only remove elements and shift the picture as a total. **It cannot change the relationship between objects.**

Focus on getting the composition right to start and use cropping later for fine-tuning.

- Cropping is subjective. **Danger of over-cropping**
- **Cropping is tied to the viewing method**

Example (Vinny & Liz)



Which one is better? The cropped (left) or the original (right)?

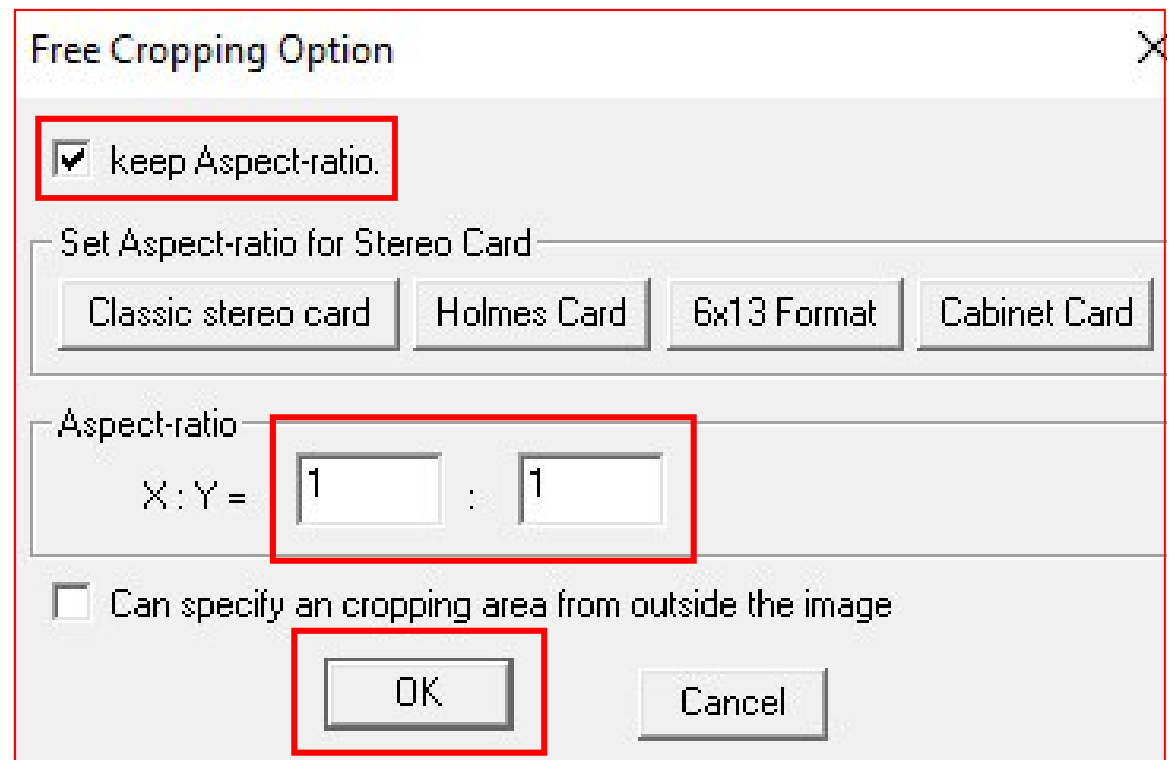
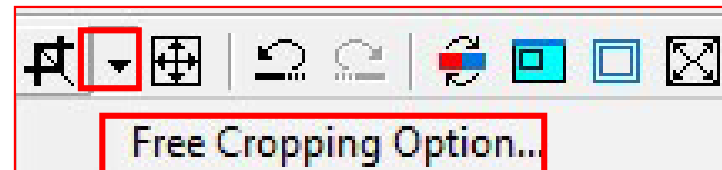
It depends. Each one tells a different story. The cropped is a nice portrait. The original shows the surroundings. None is better than the other, they are just different. Cropping is subjective!

Cropping to Change Aspect Ratio

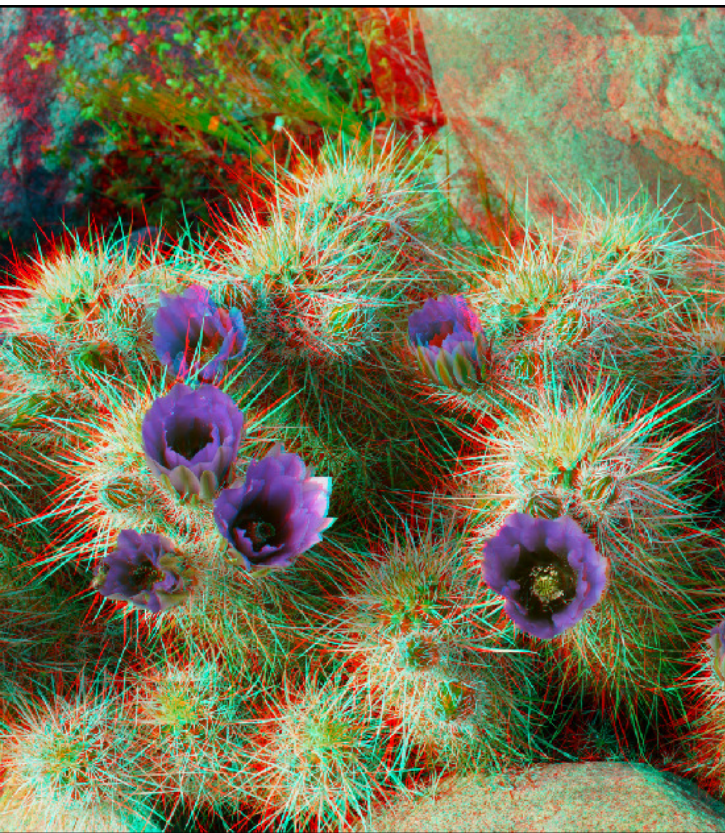
Sometimes it is useful to crop an image to a **specific aspect ratio**

I often crop to an **aspect ratio of 16:9**, which is the ratio used on most computer screens, TVs and 3D projection setups. An image cropped at this aspect ratio will occupy the largest possible screen area in stereo projection.

Those who make **stereoviews** like to crop to **1:1** aspect ratio.



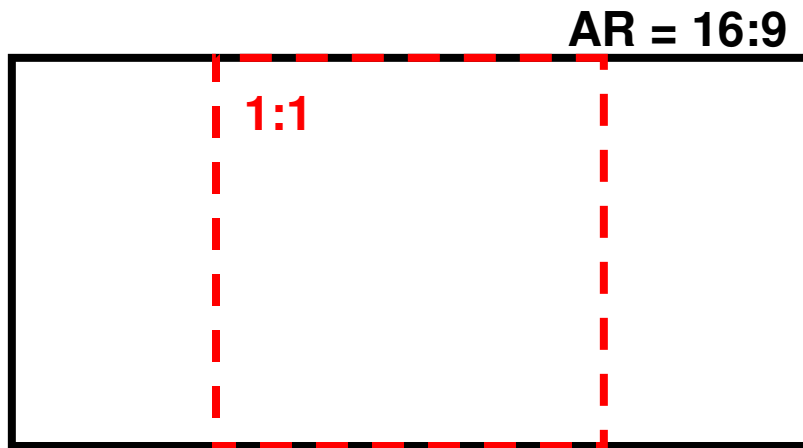
Example of Cropping to change the aspect ratio from 1:1 (left) to 16:9 (right)



The original (left) was recorded with my Sony cameras bottom-to-bottom. In this configuration I set the camera aspect ratio to 1:1.

Because I am interested in 3D TV and stereo projection, I cropped the picture to 16:9 aspect ratio to fill the TV or projection screen. This results in a magnification of 1.8x, which helps make the flowers look larger, in addition to filling the screen nicely.

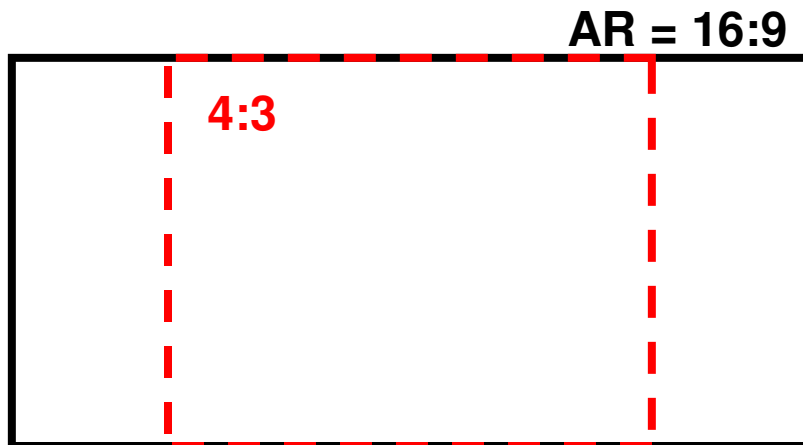
Cropping Increases Magnification and the effective Focal Length



Cropping a picture from 1:1 to 16:9

$$M = 16/9 = 1.8x$$

$$24 \text{ mm FL} \rightarrow 24 \times 1.8 = 43 \text{ mm}$$



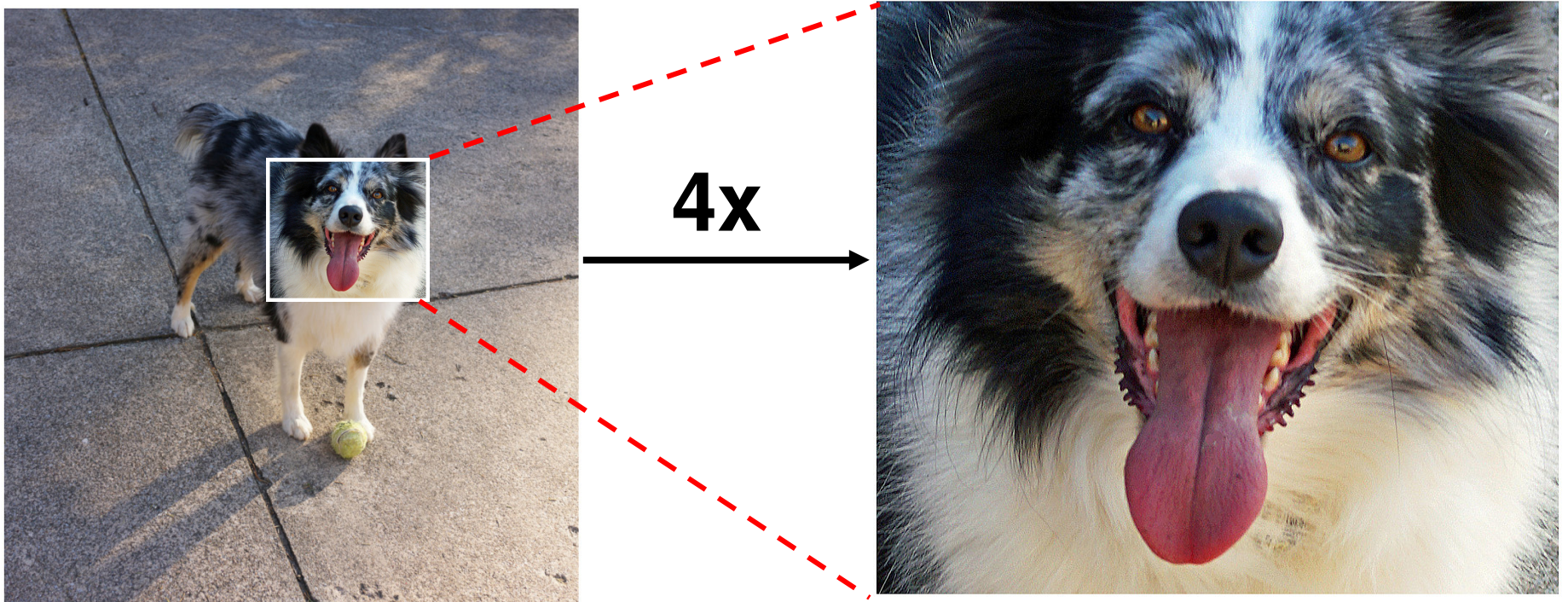
Cropping a picture from 4:3 to 16:9

$$M = 12/9 = 1.3x$$

$$18 \text{ mm FL} \rightarrow 18 \times 1.3 = 24 \text{ mm}$$

Cropping this picture resulted in a nice portrait of Vinny

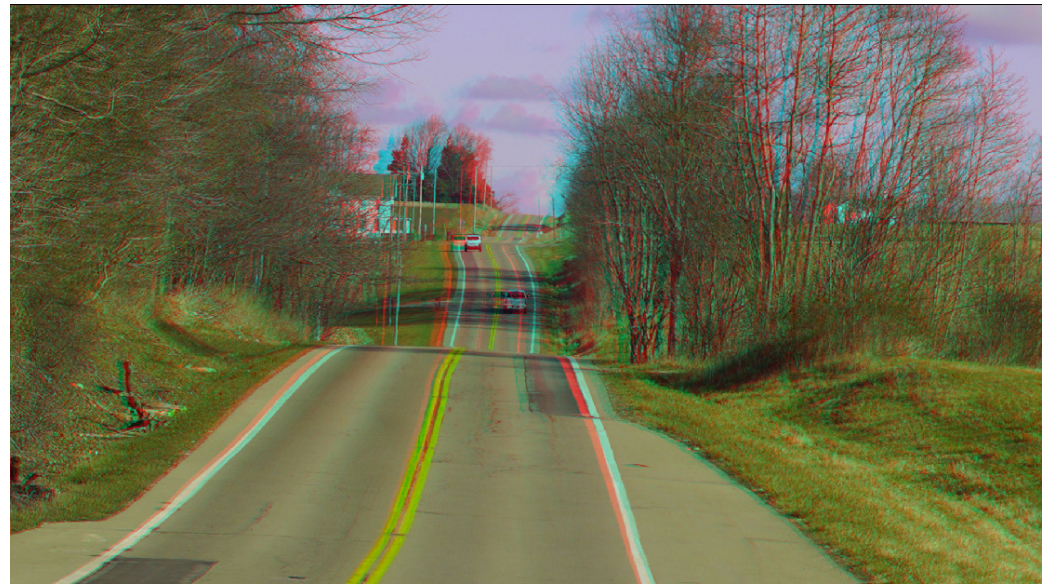
- The original (left) was recorded with 35 mm lenses
- The cropped (right) is magnified 4 times and it appears as if it was recorded with 135 mm lenses from the same location.



Magnification = 4x

Effective Focal length = 4x FL (4x 35mm ~ 135mm)

One interesting effect of cropping (and increasing the effective focal length) is something known as “**telephoto compression**.” This is seen both in 2D and 3D images.



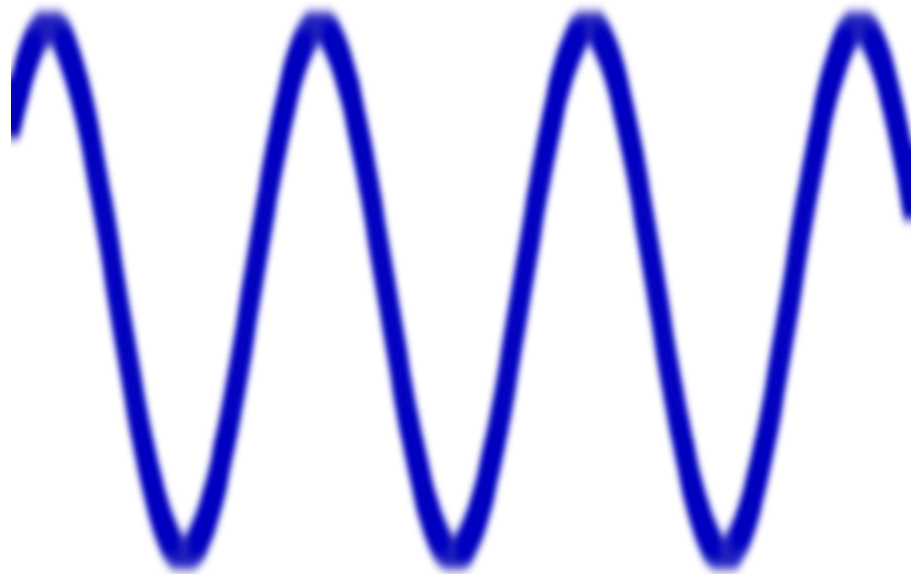
The cropped pictures (right) show signs of telephoto compression: The vertical electrical poles appear closer together and the hills/valleys are emphasized (appear steeper)

“Telephoto Compression”



Wide Angle Lenses:

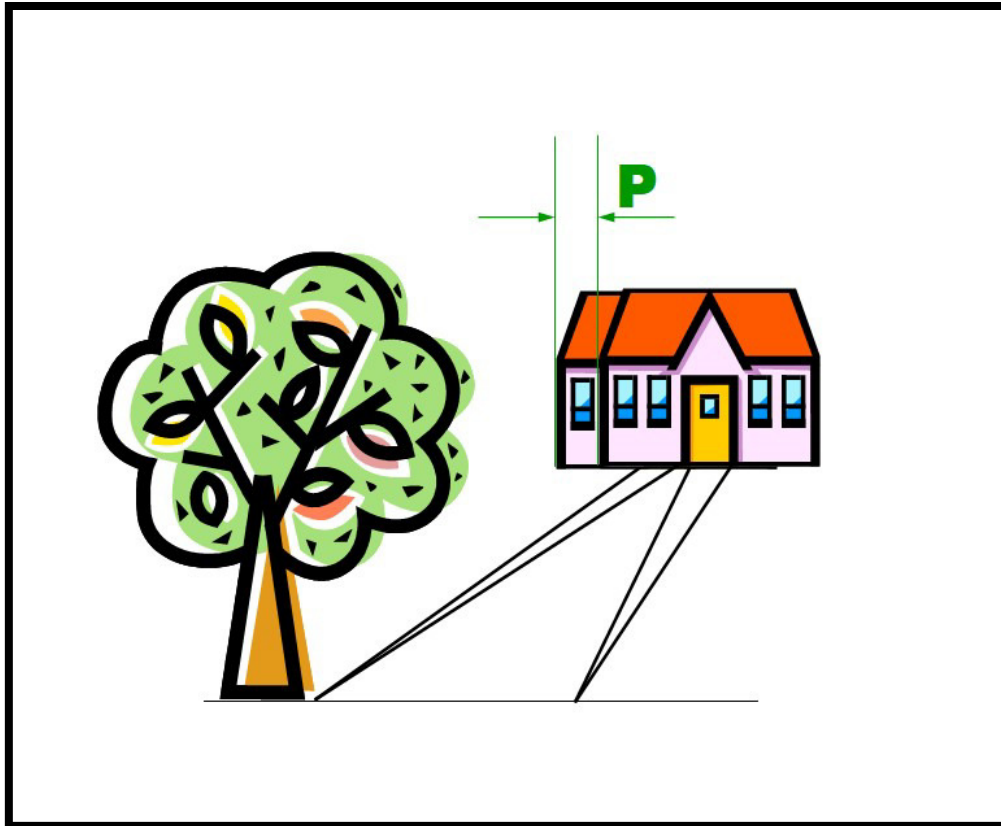
Expand Space



Telephoto Lenses:

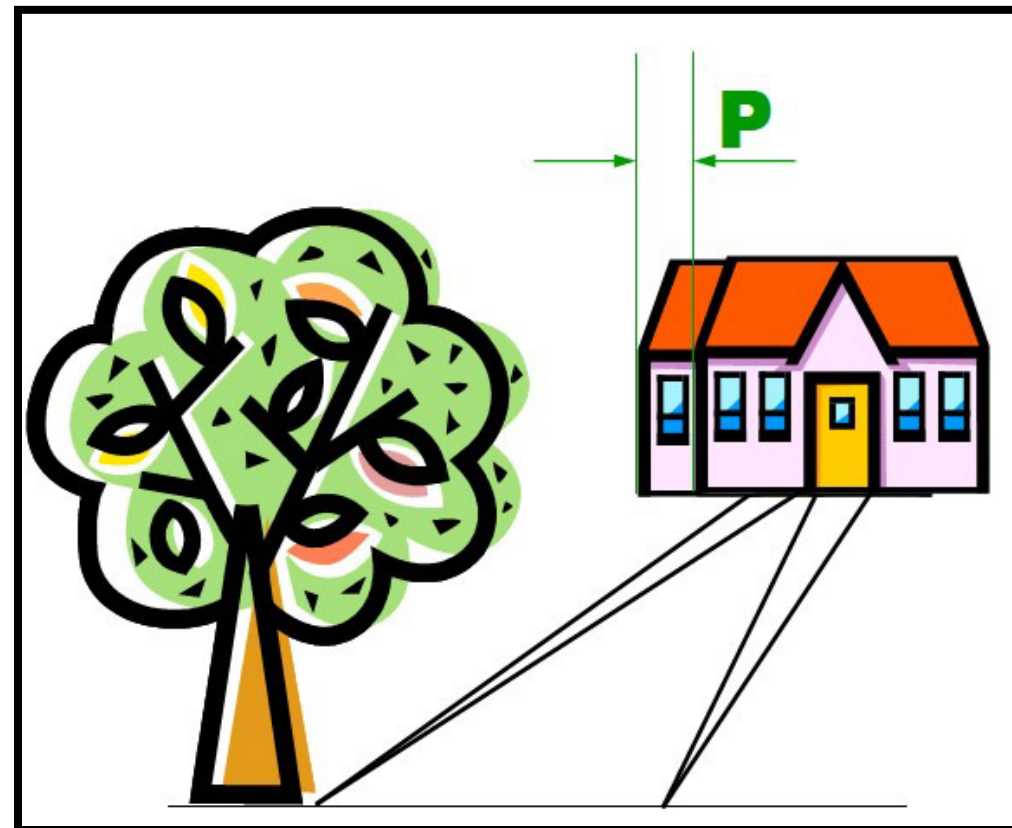
Compress Space

Cropping & Stereoscopic Deviation



Stereoscopic deviation = displacement of the far object with respect to the near object

One intuitively expects that cropping and enlarging the image will **increase the stereoscopic deviation** by the degree of enlargement

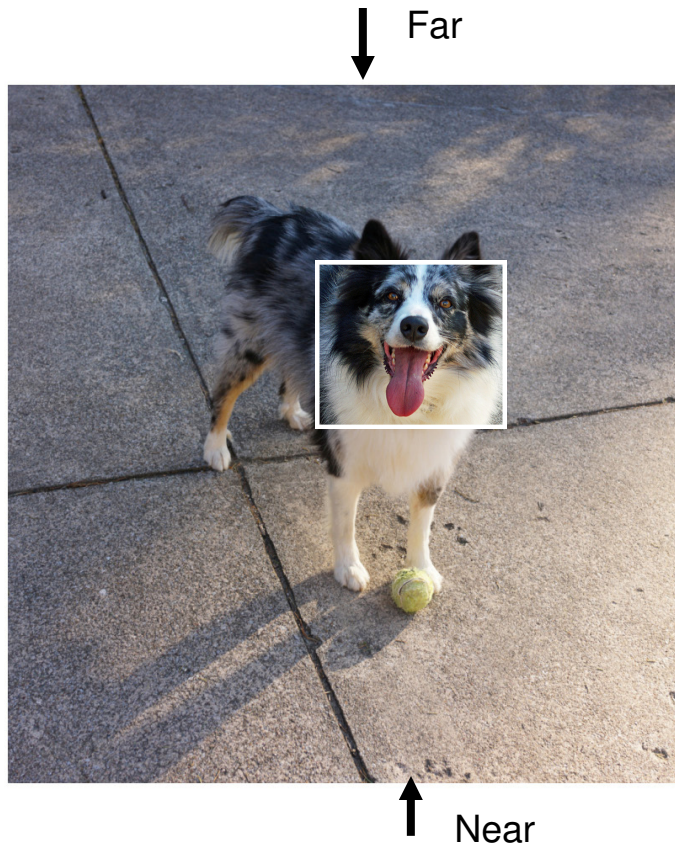


$$SD = FL \times \text{Base} / \text{Distance}$$

If the image is magnified, the SD is also magnified, **provided that cropping does not remove near/far objects**

$$1/D = 1/D_{\text{near}} - 1/D_{\text{far}}$$

Cropping & Stereoscopic Deviation



In many **real-life situations**, cropping removes near and far objects. What happens to the stereoscopic deviation is then unclear. All three situations are then possible.

1. Cropping **increases** SD
2. Cropping **decreases** SD
3. Cropping **does not change** SD

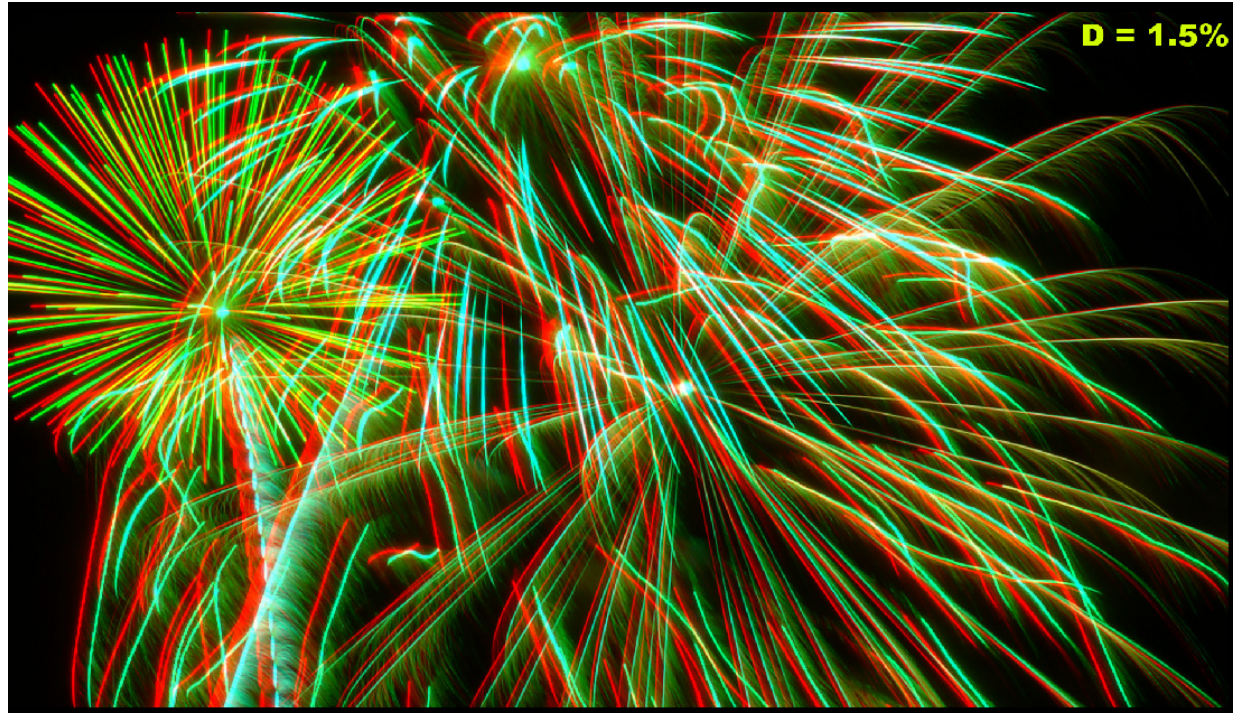
Cropping and enlarging (3x) increased the stereoscopic deviations (depth) by 3x

This happened because the near and far objects remain in the picture after cropping

D = 0.5%



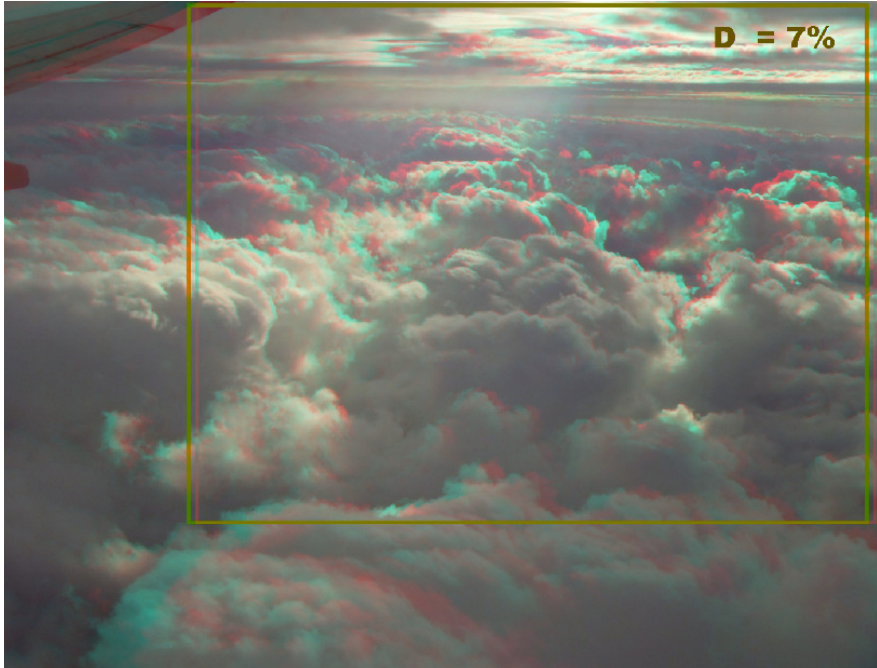
D = 1.5%



Cropping reduced the stereoscopic deviation (from 7% to 4.5%)

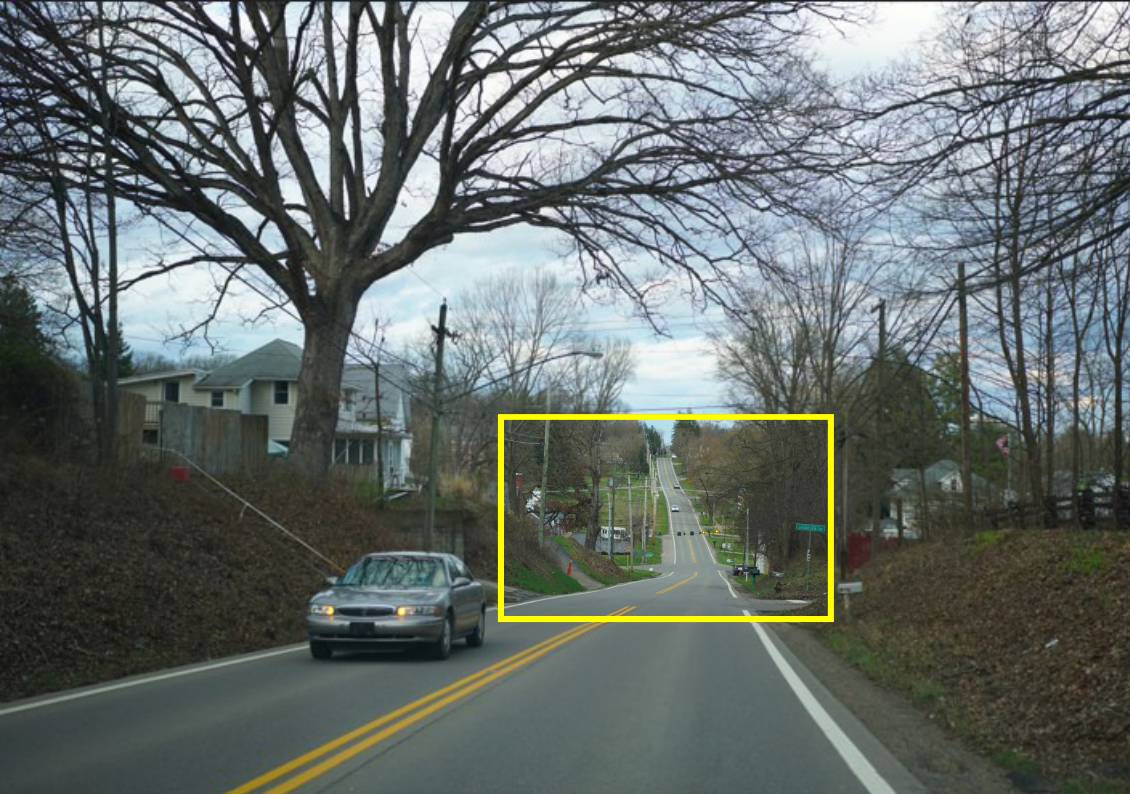
This happened because cropping removes a lot of the foreground

D = 7%



D = 4.5%





Cropping and enlarging (4x) did not change the stereoscopic deviations (depth) significantly.

The deviation went from 2% to 2.5%

This happened because cropping removed the near objects (road)

In many “normal” pictures cropping and increasing the magnification does not change the stereoscopic deviation.

One can prove mathematically that **the rate at which the near point is removed is equal to the rate at which the image is magnified.**



Infinity Road Problem



3D by DrT

Friday, March 7, 2008

Infinite Road Problem

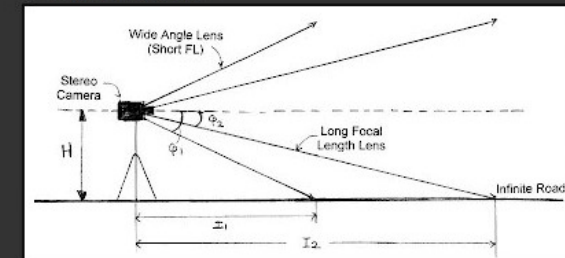
--- Background:

This is something that has been in my mind for a while, since we discussed the effects of changing the stereo base and focal length, and their interaction.

The fundamental stereoscopic formula ($P = FB/I$, P: parallax, or stereoscopic deviation, B: Stereo base, F: Focal length, I: near object distance, assuming far object is at infinity) clearly shows that increasing the focal length increases the stereoscopic deviation "for the same near object distance".

In practice however, the near distance does not stay the same as we "zoom into the scene", but it is pushed back. I have watched Jay in our stereo club, zoom into a scene using digital stereo projection. This zooming is equivalent to increasing the focal length of the recording lens (yes, it is!) and as he zooms into the scene, it appears that the magnified scene is perfectly balanced depth-wise. So, it appears that zooming into a random scene is not a problem and stereoscopic deviation is under control. While it is difficult to analyze a random scene, it is easy to analyze this "Infinite Road" situation.

--- The Problem:



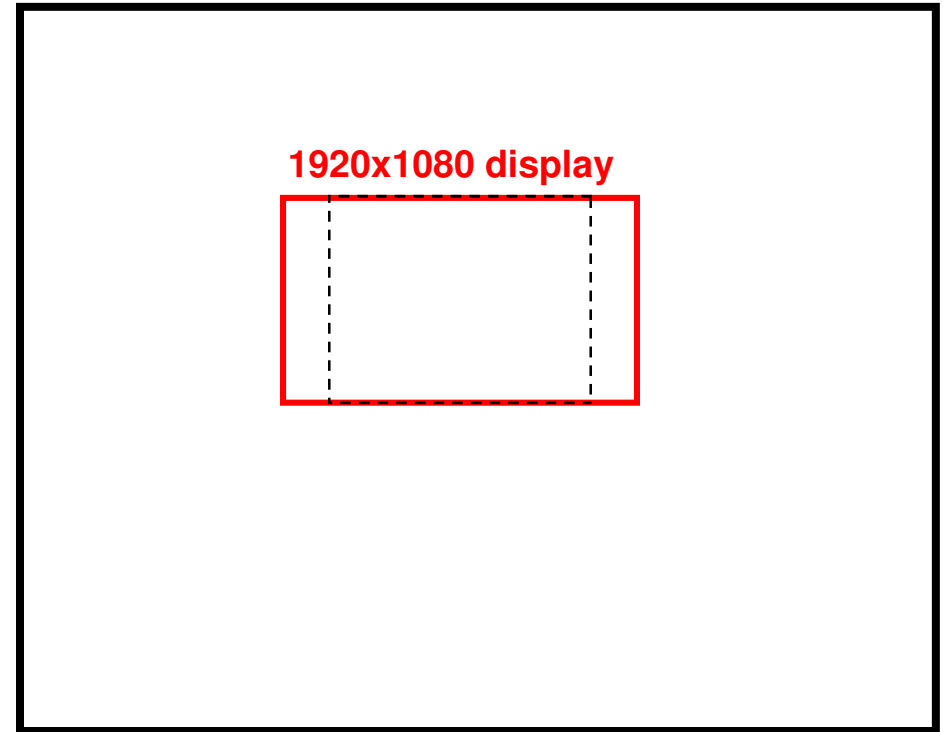
I set my camera on a tripod, at height H from the ground, in front of a road which is flat and extends far away. The only near point to the camera is this road. When I use a wide angle lens the near point is at I1 (see figure at left) If I switch to

- Set stereo camera with zoom lenses on a tripod at height H in front of a **long straight road**
- Take a series of pictures starting at the wide end and zooming in
- All these pictures have **the same stereoscopic deviation**, which only depends on the height of the camera (it is independent of the focal length)
- So, the rate at which the foreground is removed is equal to the rate that the picture is enlarged
- Even though this is a theoretical situation, **there are a lot of real-life situations that behave the same way**. In these situations, **cropping does not change the stereoscopic deviation substantially**

Extreme Cropping

- **Blow up** the picture
(SPM shortcut: “J”, or just roll the scroll mouse button)
- **Move** picture around
- See something that you like, **crop**.
- You might discover that you **like the heavily cropped picture**. Discover “a picture within a picture”

Image size (blown up)



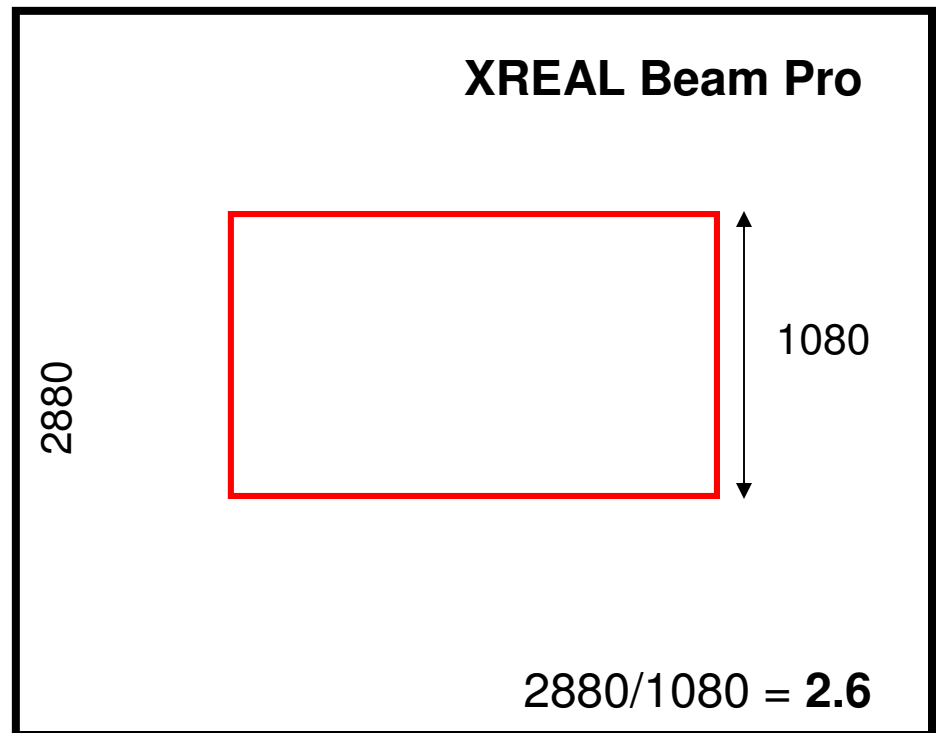
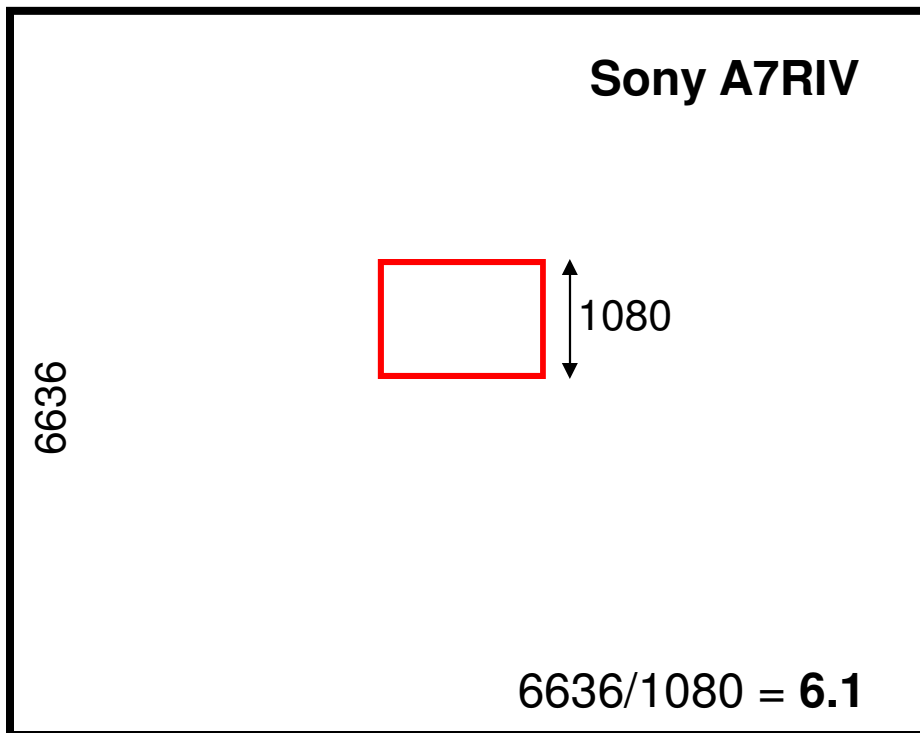
Two examples where extreme cropping seems to create a totally different image



"The Train is Coming" (Sony RX1, Original)



"The Train is Coming" (Sony RX1 - 35mm lenses cropped to ~170mm equivalent)



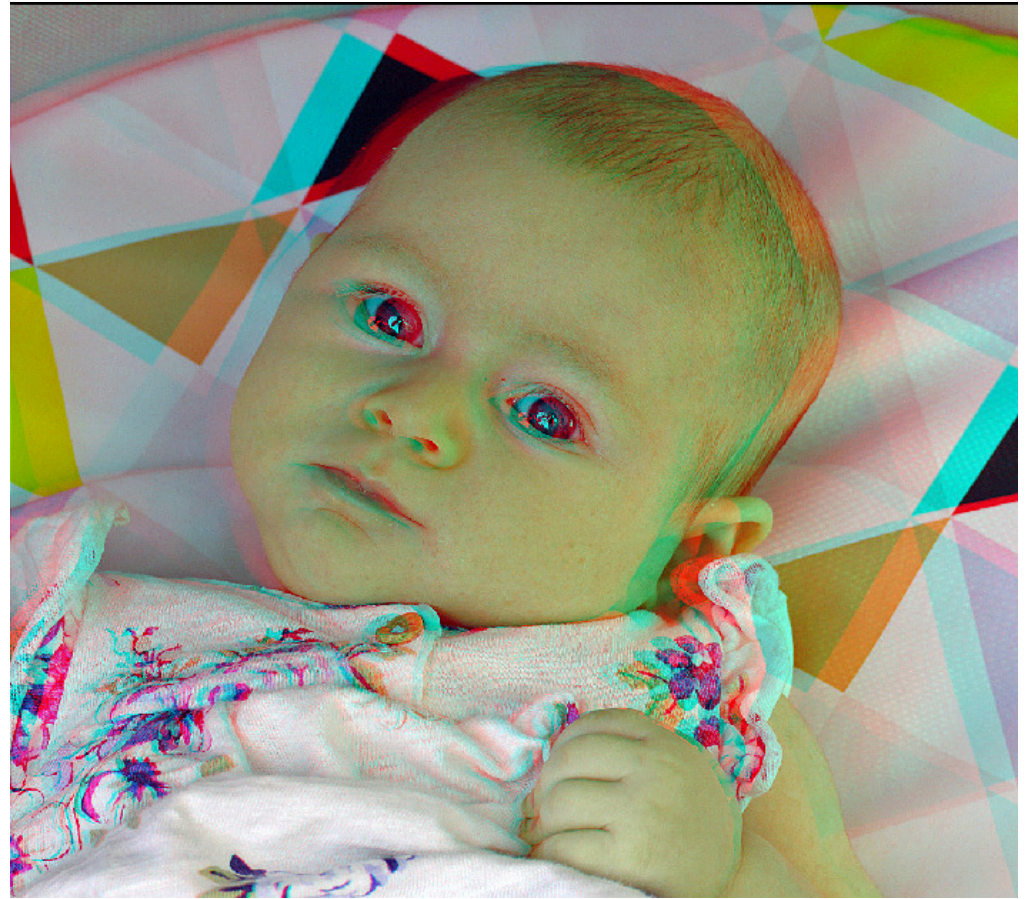
Limits of Extreme Cropping:

- ~ **3x** for normal resolution camera sensors (right)
- ~ **6x** for high resolution camera sensors (left)

What helps with “Extreme Cropping”

- **High resolution** camera (sensor)
- **Good quality** lens/sensor
- **Software** (Topaz: Gigapixel, Photo AI)

One Last Example (Baby Callista)



I took the original (left) with my Sony RX1 cameras (35mm lens, 68mm stereo base). I knew I was going to crop the original, so I did not bother to clear any distractions.

One might ask “***why didn’t you get closer to eliminate the distractions?***”

This is what a 2D photographer might ask or do. Getting closer in 2D intensifies the perspective, which might be a problem (2D photographers use long focal lenses for portraits, which produce a more pleasing perspective). But in 3D, there is another problem: Getting closer increases the depth, something that I did not want to happen here.

Cropping is a Powerful Tool



One of the best things about digital photography for me. You can:

- 1) **Remove** unwanted / distracting elements
- 2) **Focus** on your subject
- 3) **Improve** composition
- 4) Change **aspect ratio**
- 5) Increase **magnification / focal length**
- 6) Increase / decrease **stereoscopic deviation**
- 7) **Find a subject within a subject** (Extreme Cropping)