

# A1 CAMERA CLUB



## RESTRICTED DEPTH OF FOCUS

# INTRODUCTION AND OVERVIEW

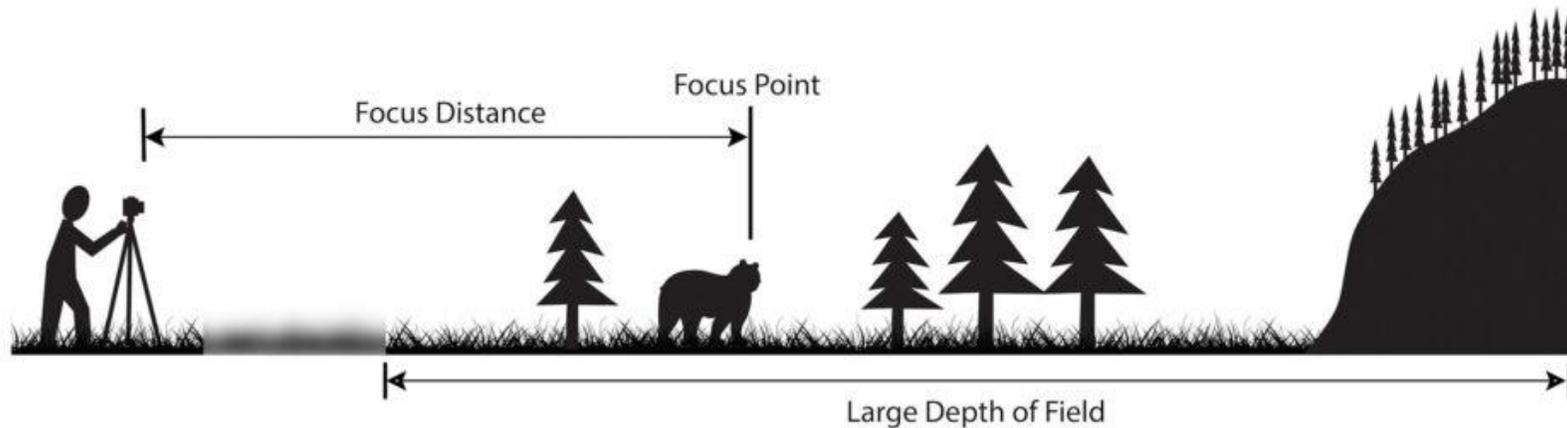
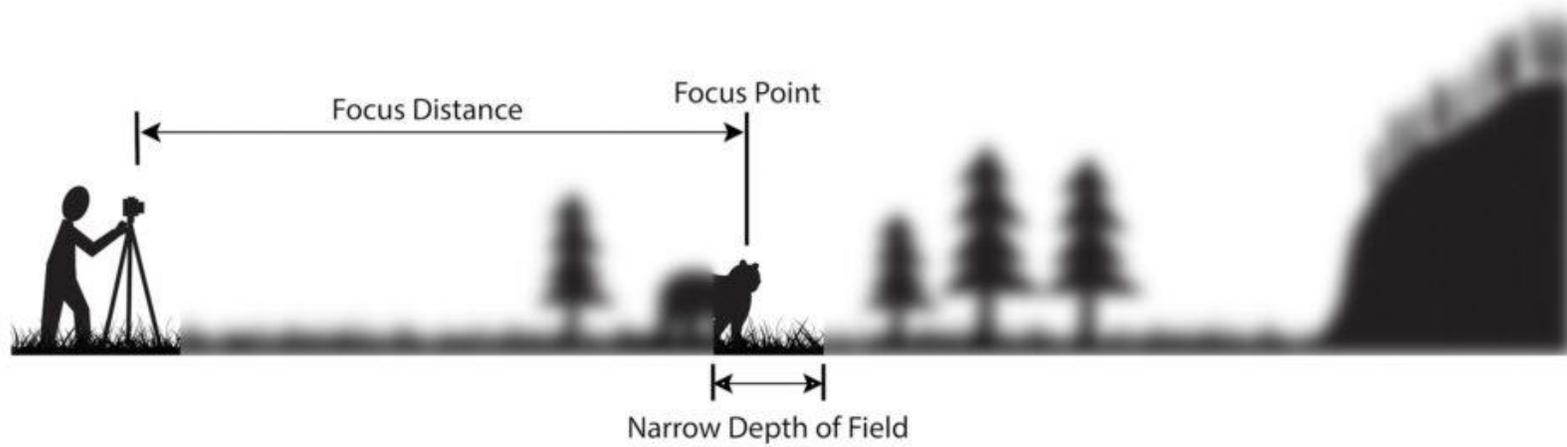
Depth of focus is a key creative tool along with the “rules” of composition, the use of colours and tones and lighting. We will be covering:

- What we mean by restricted depth of focus (“Depth of field”)
- How lenses work and the factors affecting depth of field
- Aperture and depth of field
- Subject distance and depth of field
- Common depth of field misconceptions about the focal length of a lens and crop sensor cameras
- Focusing techniques
- A review of some example images
- Down the rabbit hole
- My thoughts on mastering depth of field

# WHAT DO WE MEAN BY “DEPTH OF FIELD”

“Depth of field is the zone within a photo that appears sharp and in focus. In every picture, there is a point of focus (where you actually *focus your lens*). But there is also an area both *in front of*, and *behind*, your point of focus that also *appears* sharp – and that area corresponds to the depth of field.”

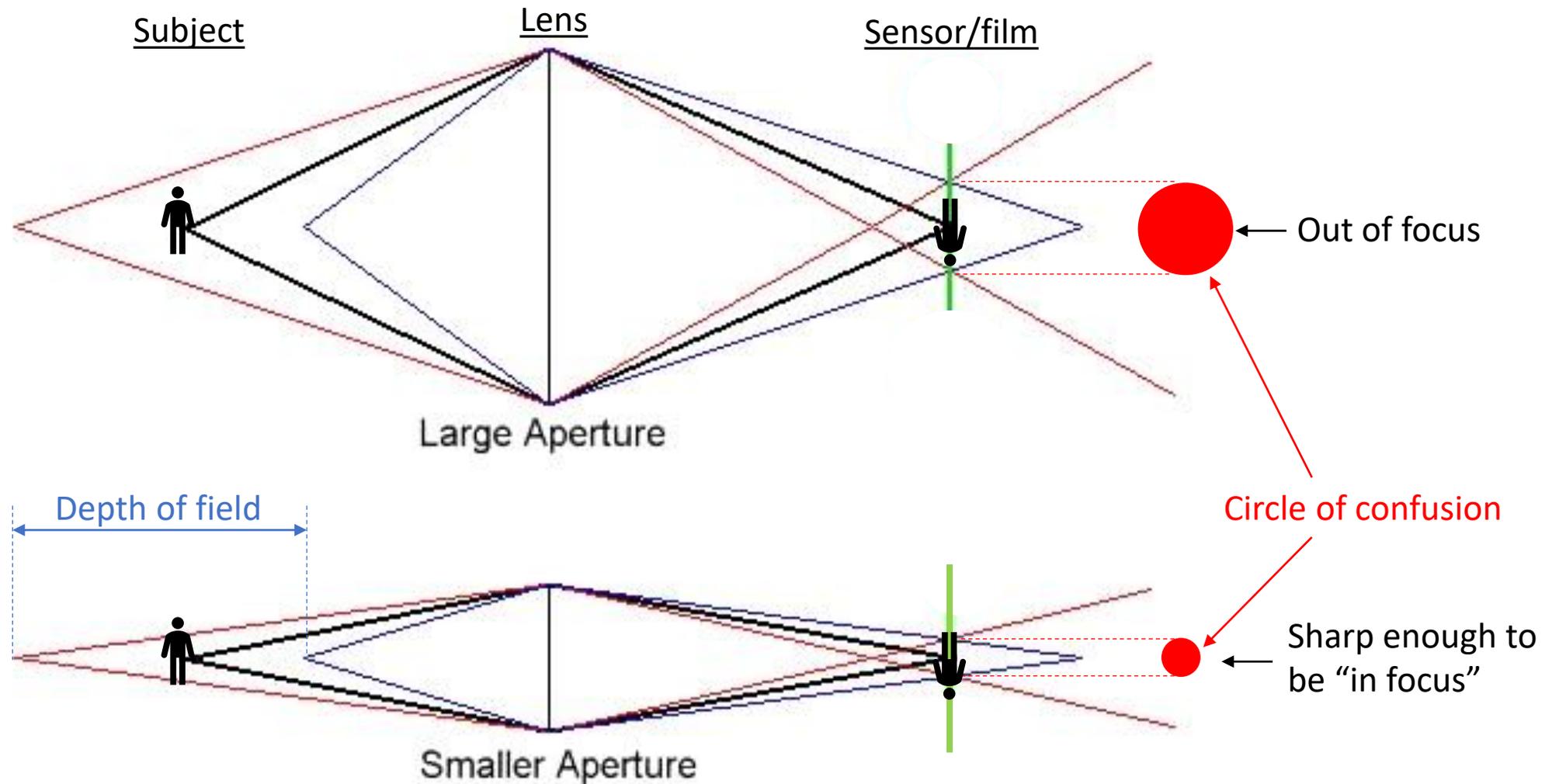
# WHAT DO WE MEAN BY DEPTH OF FIELD



# HOW IS DEPTH OF FIELD MEASURED

- Depth of field is the area in front and behind the point of focus that appears sharp.
- A standard measure of acceptable sharpness had to be set for manufacturers of lenses for design and performance assessment and as a field guide for users. This is based on the “circle of confusion”.
- It is subjective but the “circle of confusion” used to determine depth of field is defined as one which would go unnoticed when enlarged to a standard 8x10 inch print, and observed from a standard viewing distance of 1 foot.

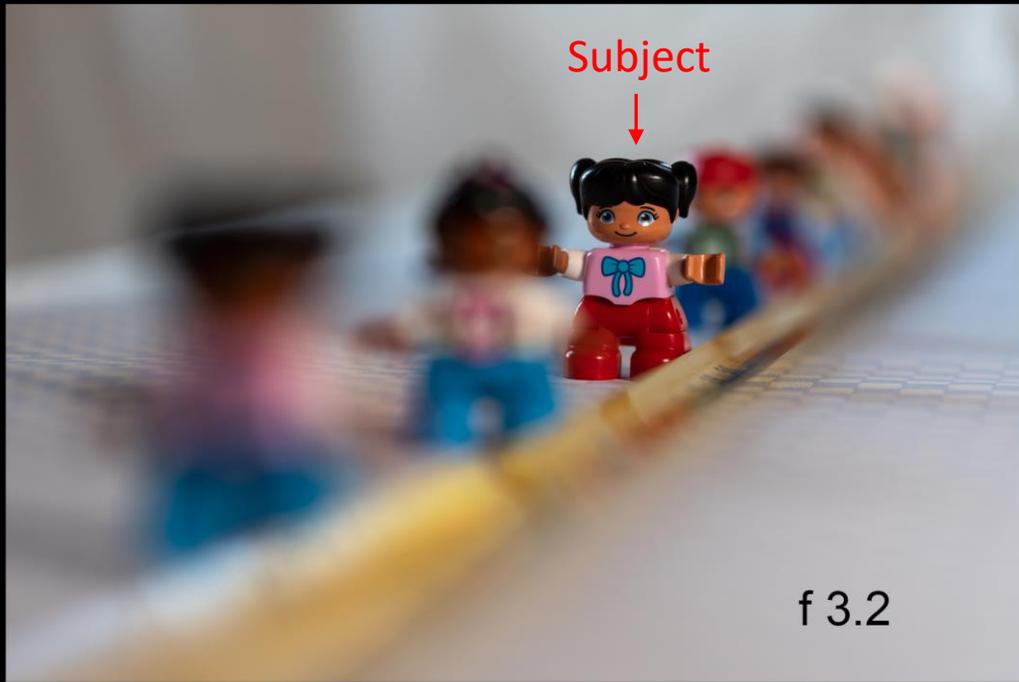
# HOW IS DEPTH OF FIELD MEASURED?



# FACTORS AFFECTING DEPTH OF FIELD

- Aperture
- Subject distance

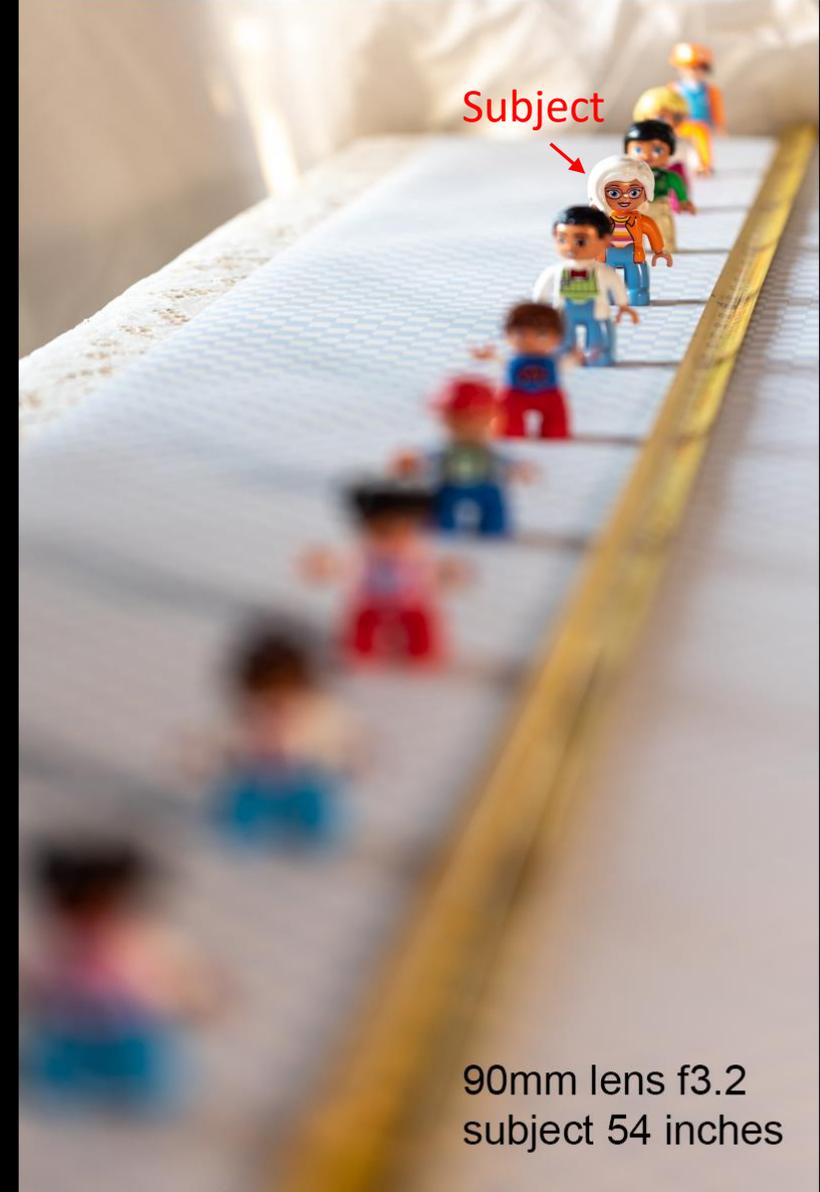
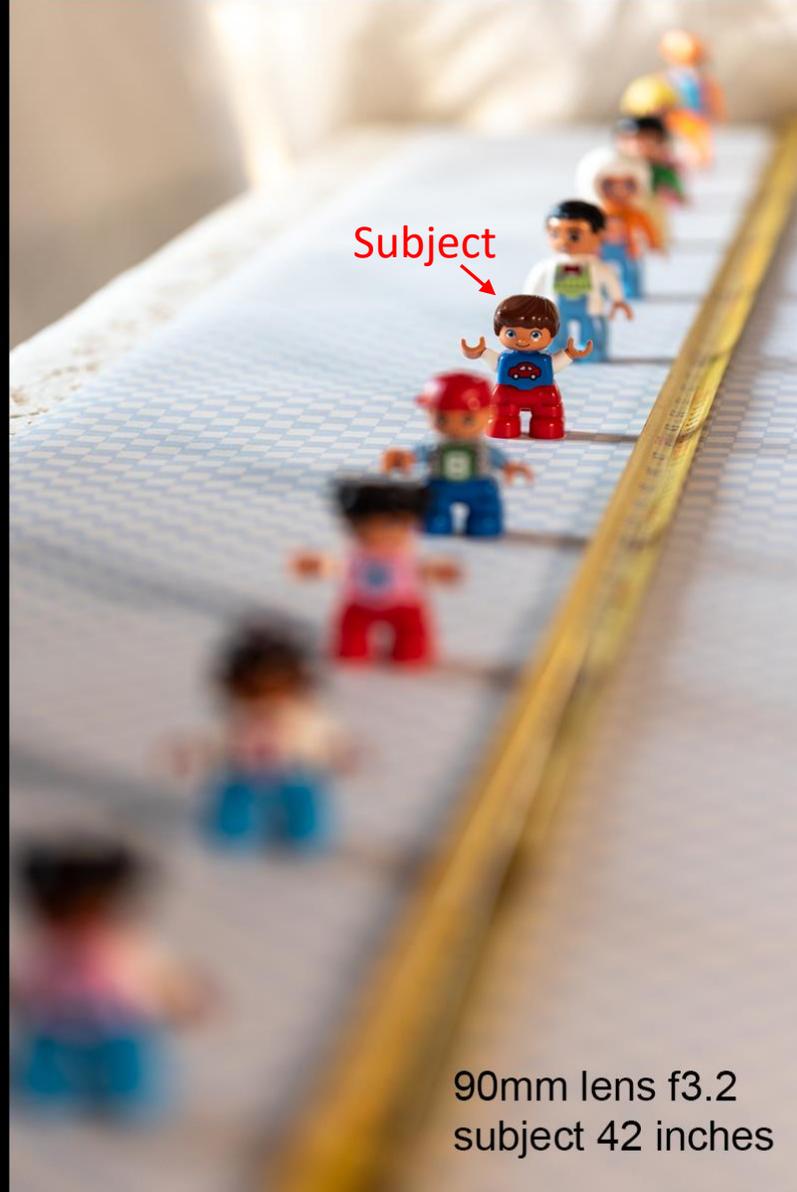
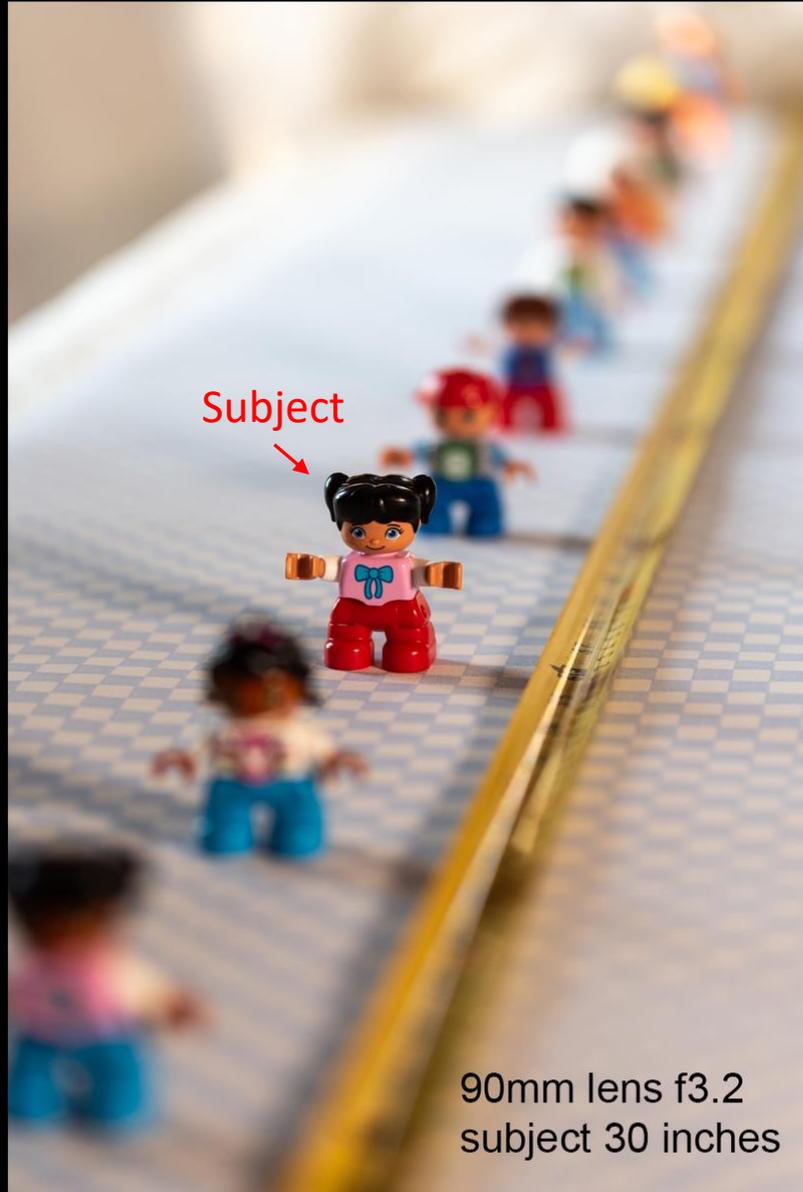
# APERTURE



# APERTURE

- Reducing the size of the aperture (increasing the f number) increases the depth of field.
- Beware of diffraction which causes softening of image when very small apertures are used.

# SUBJECT DISTANCE



# SUBJECT DISTANCE

Increasing the distance  
between the film/sensor plane  
and the subject increases the  
depth of field.

# COMMON MISCONCEPTIONS

- You can increase depth of field by using a wider lens (short focal length)
- You can increase your depth of field by using a camera with a crop sensor

In both cases you can, but.....

# FOCAL LENGTH OF LENS – SAME SUBJECT DISTANCE

(Wide to mild telephoto focal lengths)

Uncropped



# FOCAL LENGTH OF LENS— SAME SUBJECT DISTANCE

(Wide to mild telephoto focal lengths)

Cropped to aid comparison



# FOCAL LENGTH OF LENS - SAME SUBJECT DISTANCE

The foregoing comparisons clearly show an increase in depth of field when using a wider lens.

But the wider lens also reduces the size of your subject in the frame resulting in the need to crop the image to get the desired framing.

What happens if you move closer to make your subject larger in the image frame?

# FOCAL LENGTH OF LENS - SIMILAR SUBJECT FRAMING

(Wide to mild telephoto focal lengths)

Uncropped – subject size (man with green bin) approx. the same in each image



# FOCAL LENGTH OF LENS - SIMILAR SUBJECT FRAMING

(Wide to mild telephoto focal lengths)

Cropped to aid comparison



# FOCAL LENGTH OF LENS - SIMILAR SUBJECT FRAMING

(Reduced subject distance to maintain subject size in the image frame)

The foregoing comparison demonstrates that the increased depth of field for the wider angle lenses reduces significantly when you get closer to the subject.

The following table also shows that the greater depth of field is limited to wide angle lenses and this is demonstrated in the next comparison.

Focal Length (mm)	Focus Distance (m)	Depth of Field (m)
10	0.5	0.482
20	1.0	0.421
50	2.5	0.406
100	5.0	0.404
200	10	0.404
400	20	0.404

Note: Depth of field calculations are at f/4.0 on a camera with a 1.6X crop factor, using a circle of confusion of 0.0206 mm.

Source: [Understanding Depth of Field in Photography \(cambridgeincolour.com\)](http://cambridgeincolour.com)

# DEPTH OF FIELD - SIMILAR SUBJECT FRAMING (Different telephoto focal lengths)



# FOCAL LENGTH OF LENS - CONCLUSIONS

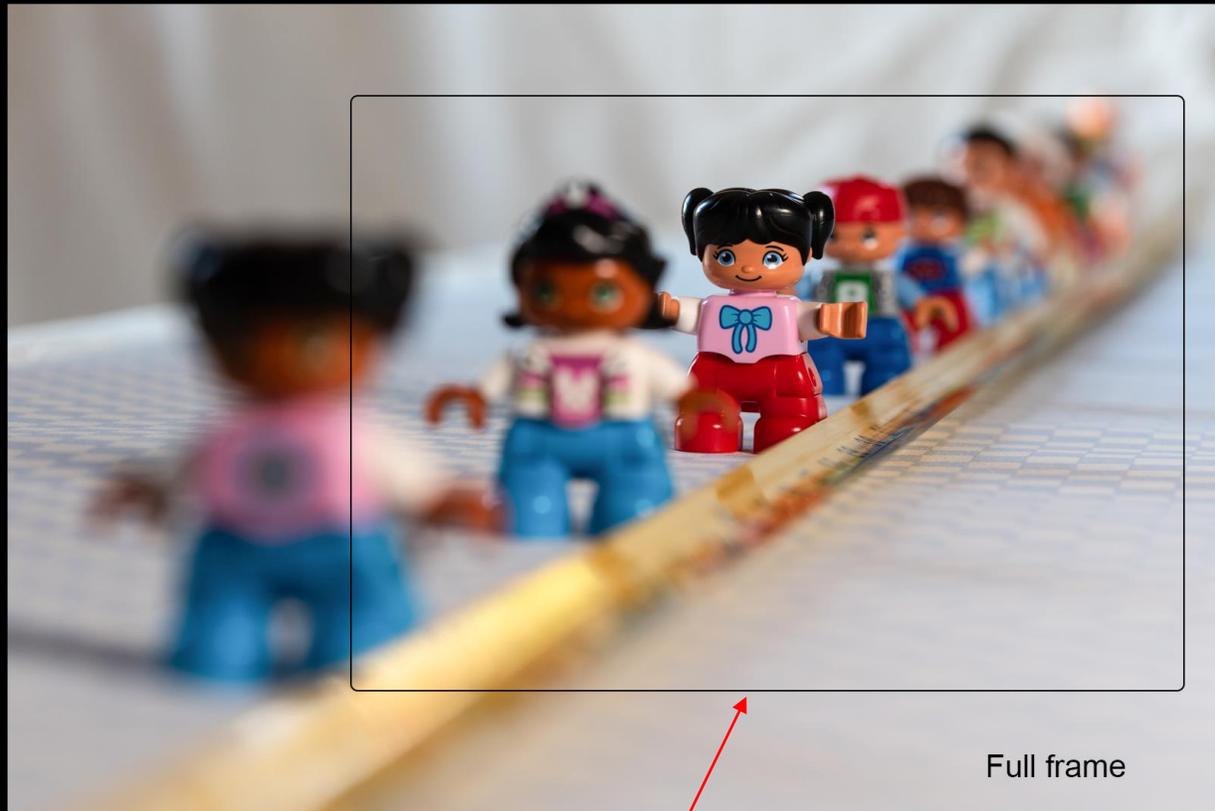
- Wide angle lenses can be used to achieve a greater depth of field but if you need to get closer to your subject to frame your image it substantially negates the benefit of the greater depth of field.
- Differences in depth of field using telephoto lenses to achieve the same image framing are negligible.
- Choose the best lens for the job bearing in mind any physical restrictions on subject distance and your lens minimum focusing distance

# THE CROP SENSOR MYTH

- The common view seems to be that “ A camera with crop sensor gives you greater depth of field”
- This is fuzzy thinking. If you use the same lens with the same aperture and the same subject distance there will be no difference in depth of field between a full frame and a crop sensor camera.
- It is more accurate to say that “A camera with a crop sensor will allow you to frame your image with a greater depth of field by using a wider angle lens than you would on a full frame camera or by increasing your subject distance”
- The depth of field effects of wide angle lenses and subject distance have already been demonstrated. The following comparison shows the effects of using the same lens, same settings and subject distance with full frame and crop sensor cameras.

# THE CROP SENSOR MYTH

(Uncropped images using same lens, same settings and same subject distance)



Full frame image crop area for comparison  
(sorry about the misalignment)

# THE CROP SENSOR MYTH

(Cropped full frame vs uncropped DX image)



# CROP SENSOR – CONCLUSIONS

- Using the same lens and subject distance with full frame and crop sensor cameras produces the same depth of field.

Note: While this may broadly hold true for small differences in sensor size there will be a point where sharpness and depth of field reduce below acceptable levels when using smaller and smaller sensors.

- Using a crop sensor camera:
  - Will allow you to increase your subject distance and achieve the same subject framing
  - May give you better resolution than cropping an image from a full frame camera.

# FOCUSING TECHNIQUES

- Subject focusing

Focusing on the subject and adjusting the aperture to achieve the desired depth of field.

- Hyperfocal distance

Focusing your camera at the hyperfocal distance ensures maximum sharpness from approximately half this distance all the way to infinity. It is also the source of the rule of thumb approach of focusing  $1/3^{\text{rd}}$  of the way into the image ..... more on both of these later.

- Focus stacking

Using software to combine images that have been shot using different focal points to produce a single image which is sharp throughout the desired focal range.

# HYPERFOCAL DISTANCE



Tables and calculators:

[Hyperfocal Distance Table | PhotoPills](#)

[Understanding Your Camera's Hyperfocal Distance \(cambridgeincolour.com\)](#)

Apps:

<http://www.photopills.com/>

[Pluto Trigger - A versatile smart camera remote](#)

There will be many others.

# HYPERFOCAL DISTANCE

The fraction of the depth of field which is in front of and behind the focus distance does change with focal length, as demonstrated below:

Focal Length (mm)	Distribution of the Depth of Field	
	Rear	Front
10	70.2 %	29.8 %
20	60.1 %	39.9 %
50	54.0 %	46.0 %
100	52.0 %	48.0 %
200	51.0 %	49.0 %
400	50.5 %	49.5 %

Source [Understanding Depth of Field in Photography \(cambridgeincolour.com\)](http://cambridgeincolour.com)

# SOME EXAMPLES – MACRO/CLOSE UP



Simon Williams

# SOME EXAMPLES - WILDLIFE



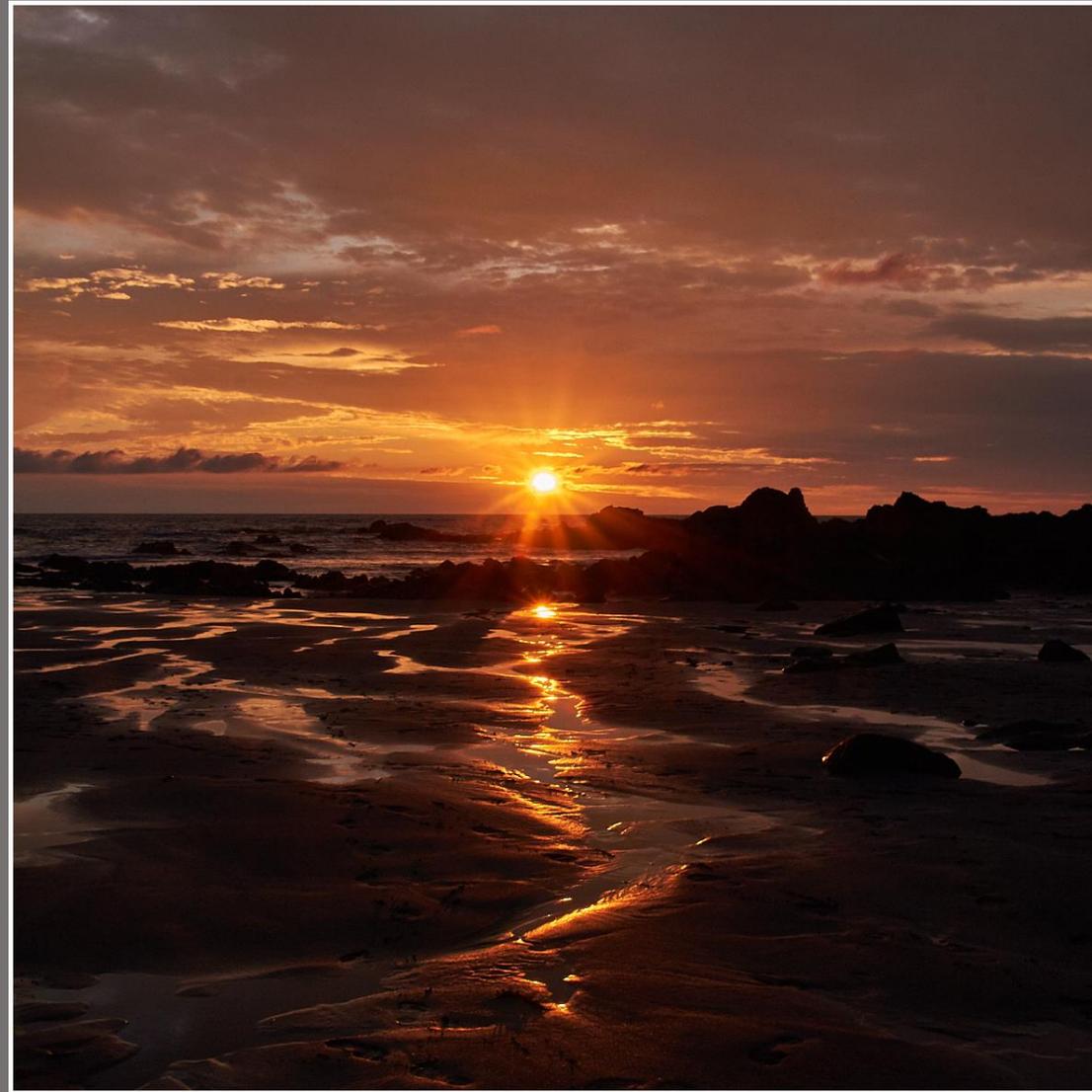
Simon Williams

# SOME EXAMPLES - PORTRAIT



Cristina Liviero

# SOME EXAMPLES - LANDSCAPE



Keith Spicer

# SOME EXAMPLES – FORCED PERSPECTIVE



Found on web

# SOME EXAMPLES – CREATIVE BOKEH



Howard Evans

# SOME EXAMPLES – SELECTIVE FOCUS



John Scaife

# SOME EXAMPLES – SELECTIVE FOCUS



Nigel Brown

# DOWN THE RABBIT HOLE

There are two developments/fashions of particular interest when considering depth of field and selective focus:

- Tilt lenses/Free lensing
- Optically imperfect lenses

# TILT LENS/FREELENSING

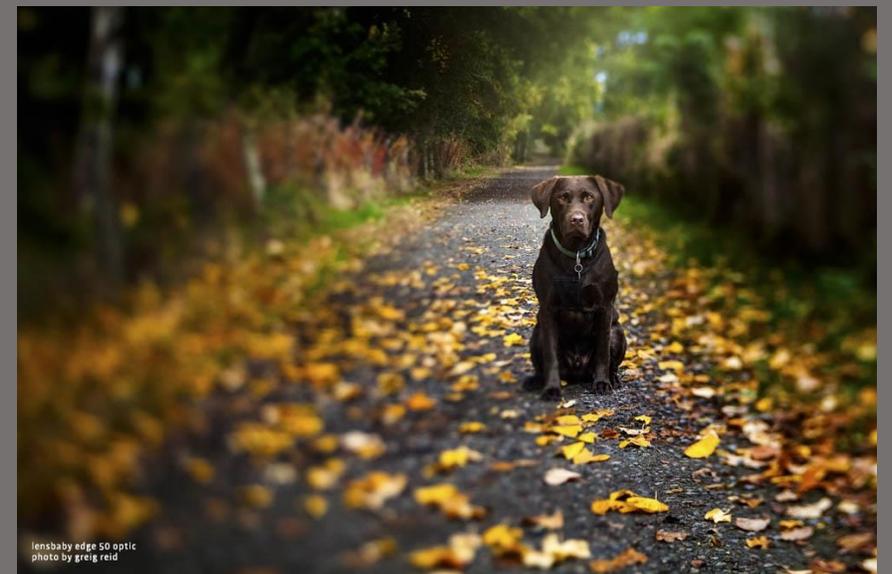
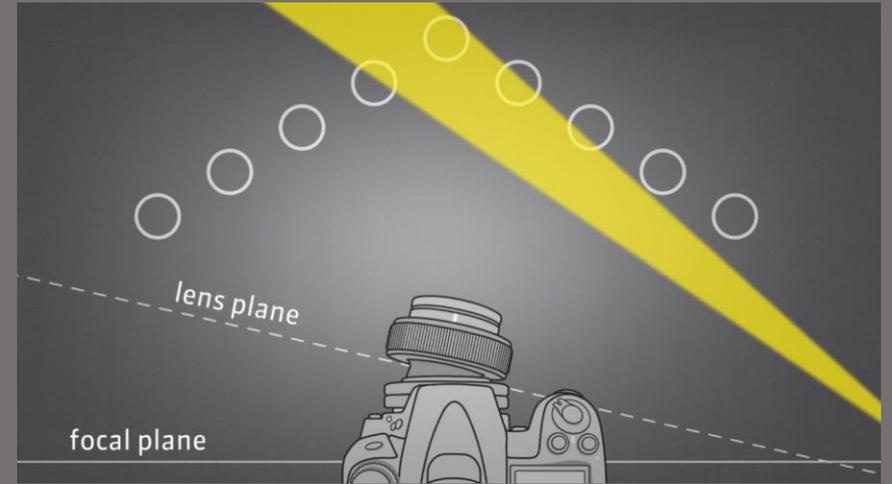
Freelensing requires you to detach your lens from the camera and use it freehand to shift the plane of focus.

The Lensbaby “Composer” uses a ball and socket design and when coupled with a Lensbaby “Edge” optic it can achieve the same results (but no lens flare/light leaks) in a more controlled manner:

- Tilting the lens changes the angle of the plane of focus.
- Changing focus moves the plane of focus across the frame.

Allowing you to isolate a band of focus like this →

Note: this is not the same as a tilt/shift lens which is a more expensive specialist lens used to correct perspective.



# OPTICALLY IMPERFECT LENSES

The Lensbaby “Double Glass” (50mm f/2) is a selective focus optic which creates a sharp "sweet spot" of focus surrounded by blur.

The “sweet spot” is expanded and blur is reduced by reducing the size of the aperture.

Used with the Lensbaby “Composer” the “sweet spot” can be placed virtually anywhere in the frame.



# OPTICALLY IMPERFECT LENSES

There are forums and Facebook groups dedicated to the use of vintage and modified vintage lenses.

Members are generally seeking a “vintage” look or a new creative avenue to explore and develop their photography.

One of the most commonly used lenses is the Russian Made Helios 44 2/58 on an M42 mount.

Used in unmodified form this lens has good colour rendition, nice bokeh and when shot wide open and it can produce an interesting twirling bokeh similar to a Petzval lens.

It is also easy to modify by reversing the front lens element which then produces an interesting “bubble” bokeh.



Anders Kankfelt - Helios 44 2/58 reversed front element

# MASTERING DEPTH OF FIELD

Set your camera to manual or aperture priority.

Think about your composition, what do you want in focus, how soft do you want out of focus areas and what does this mean for your choice of lens, subject distance and aperture?

Use “depth of field preview”, “live view” or “focus peaking” to check depth of field.

Know your lenses. How close can they focus, which aperture settings are sharpest, which are softest and what is the quality of bokeh at the widest apertures on each lens?

If you have a zoom lens or carry more than one lens with you, experiment with different focal lengths, apertures and subject distances.

If you have full frame and crop sensor cameras try them both out with the same subject.

Practice, experiment and enjoy!

