Depth of Field

What am I trying to see?

Depth of Field

- There's the technical definition
- Then there's the usefulness of it
- Then there's the how to control it

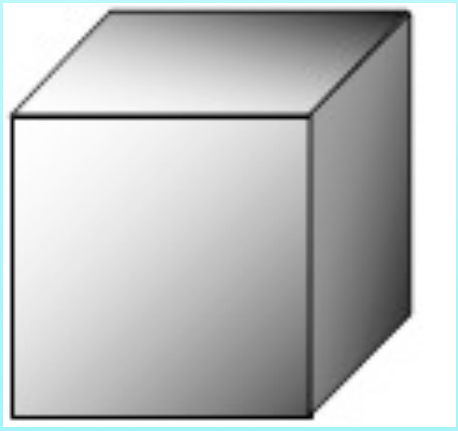
Depth of Field

- Property of our eyesight, not the camera

Depth of Field

Most of the world is three dimensional; e.g., it has distance from our eye that is measured left to right, bottom to top, and near to far

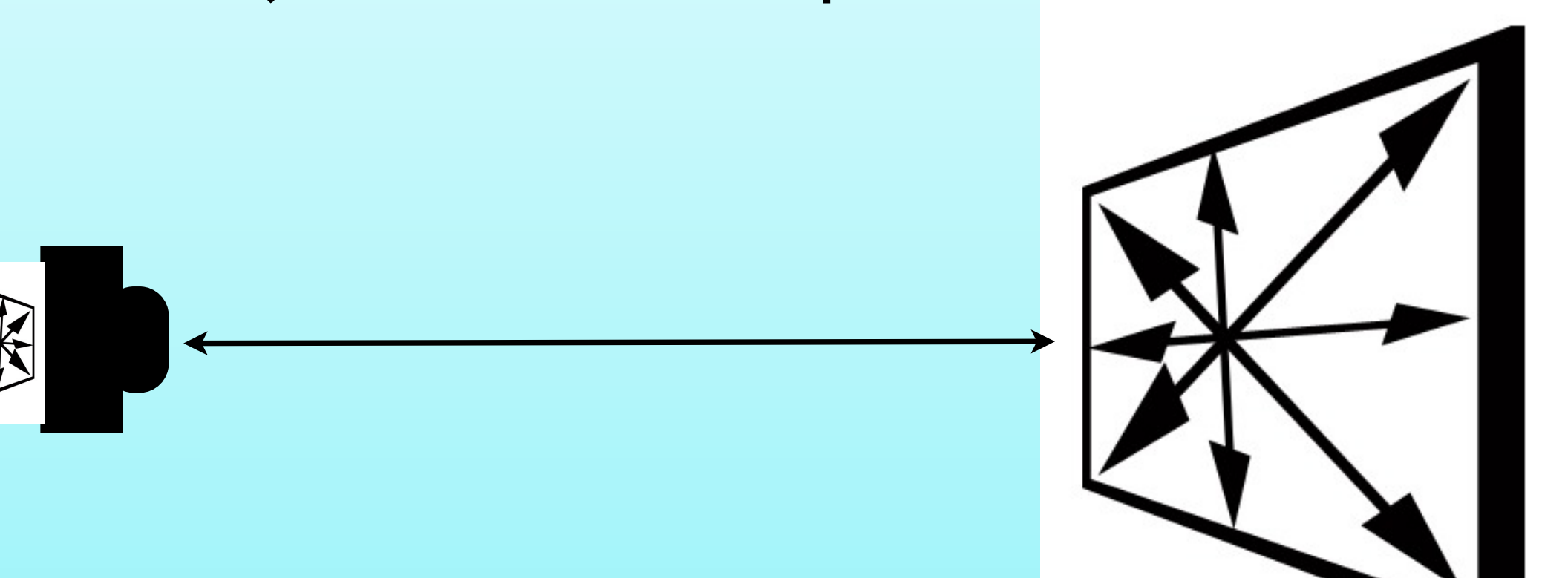
Because our vision is stereo we are able to perceive the near to far as *depth*, so objects don't appear to be flat



Depth of Field

A perfect lens will focus light to a series of points on the film or sensor

Those points will correspond to all the points on the subject that lie on a “plane” parallel to the len



Depth of Field

So, to the lens, the world appears flat, without dep

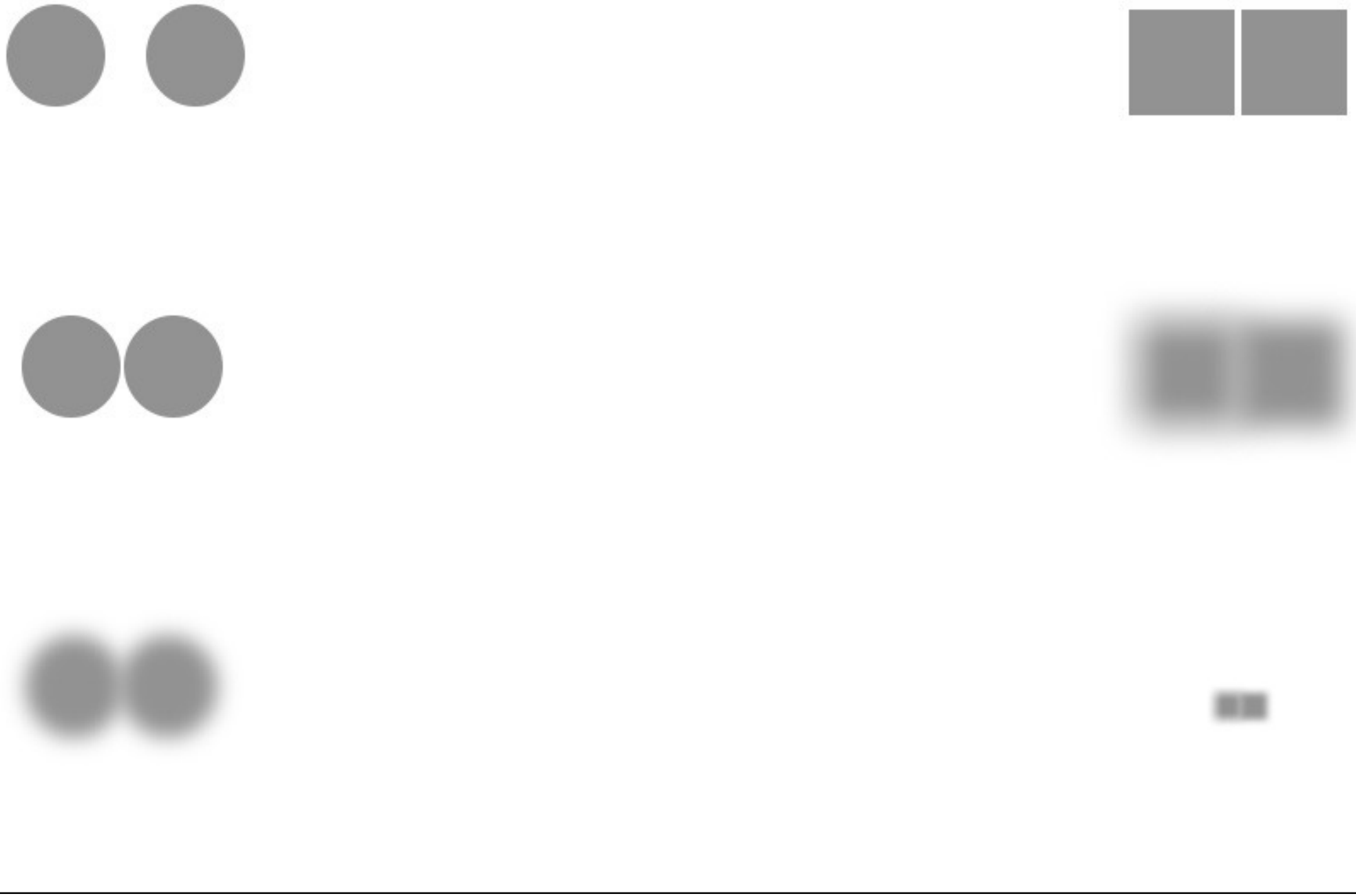
By focusing a lens, we are viewing "slices" of the fl
world that are at the plane of focus.

The part of our images in focus is based on how
many of these "slices" our eye can *resolve*.

How do we See?

Resolution is a measure of how well our eye can distinguish a distance between two points.

We declare an object "in focus" when we can't distinguish ('resolve') a difference between points on the object.



or individual points this seems like an easy exercise
although smaller points are harder to resolve.

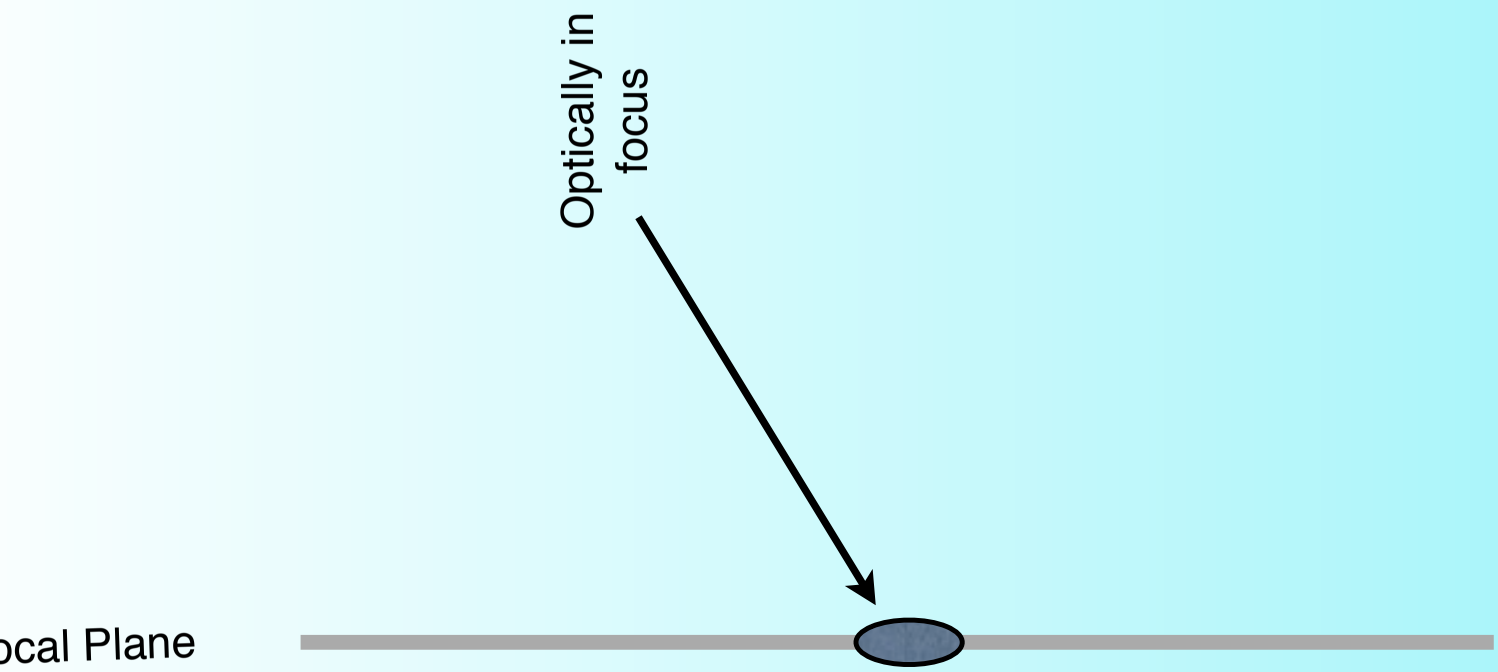
images it can be harder. Most of the image
ve appears to be in focus. But looking at
rged areas shows only part of the dome is
ally in focus, the rest is not. Much of the
ge that is off the focus plane appears be to
cus because our eye can't easily resolve

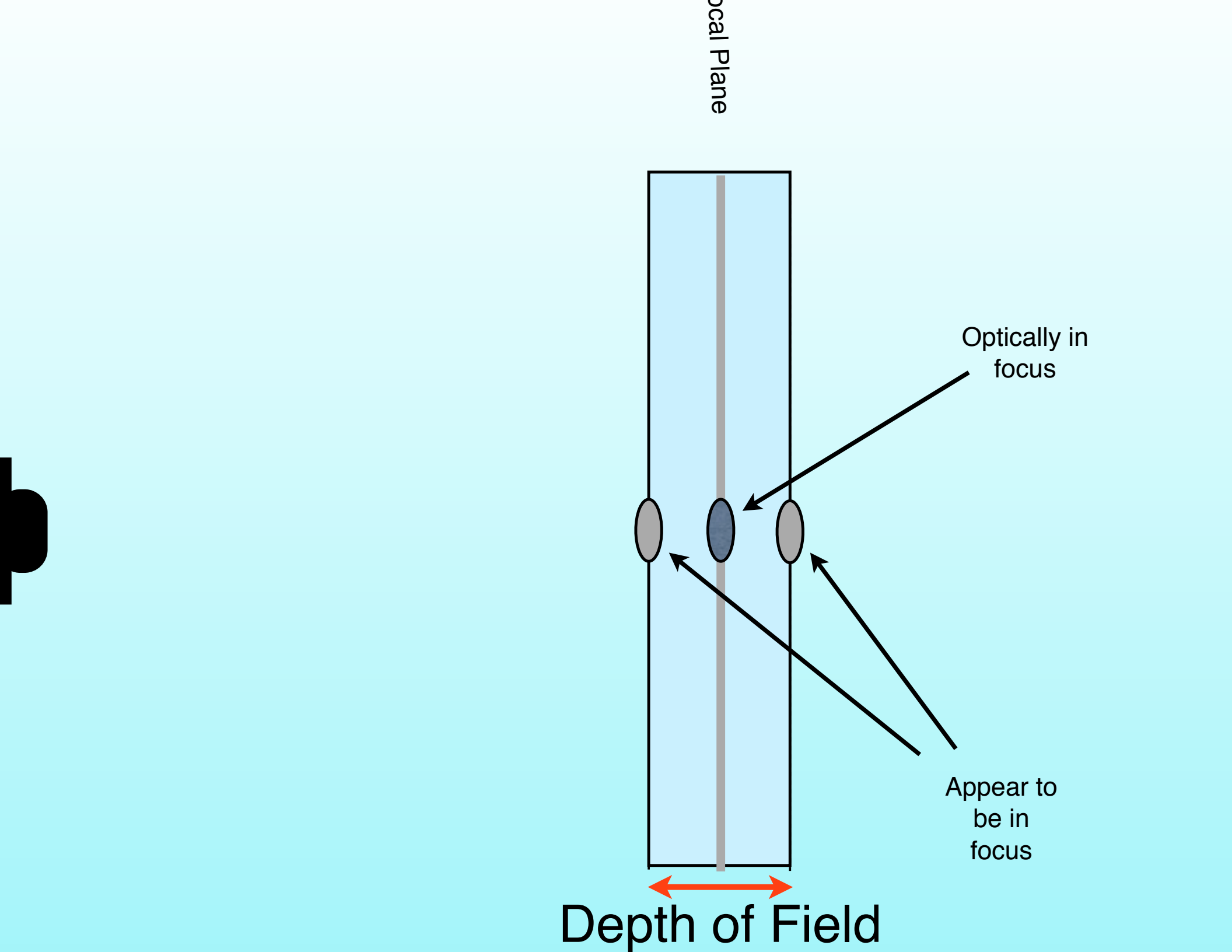
Depth of Field

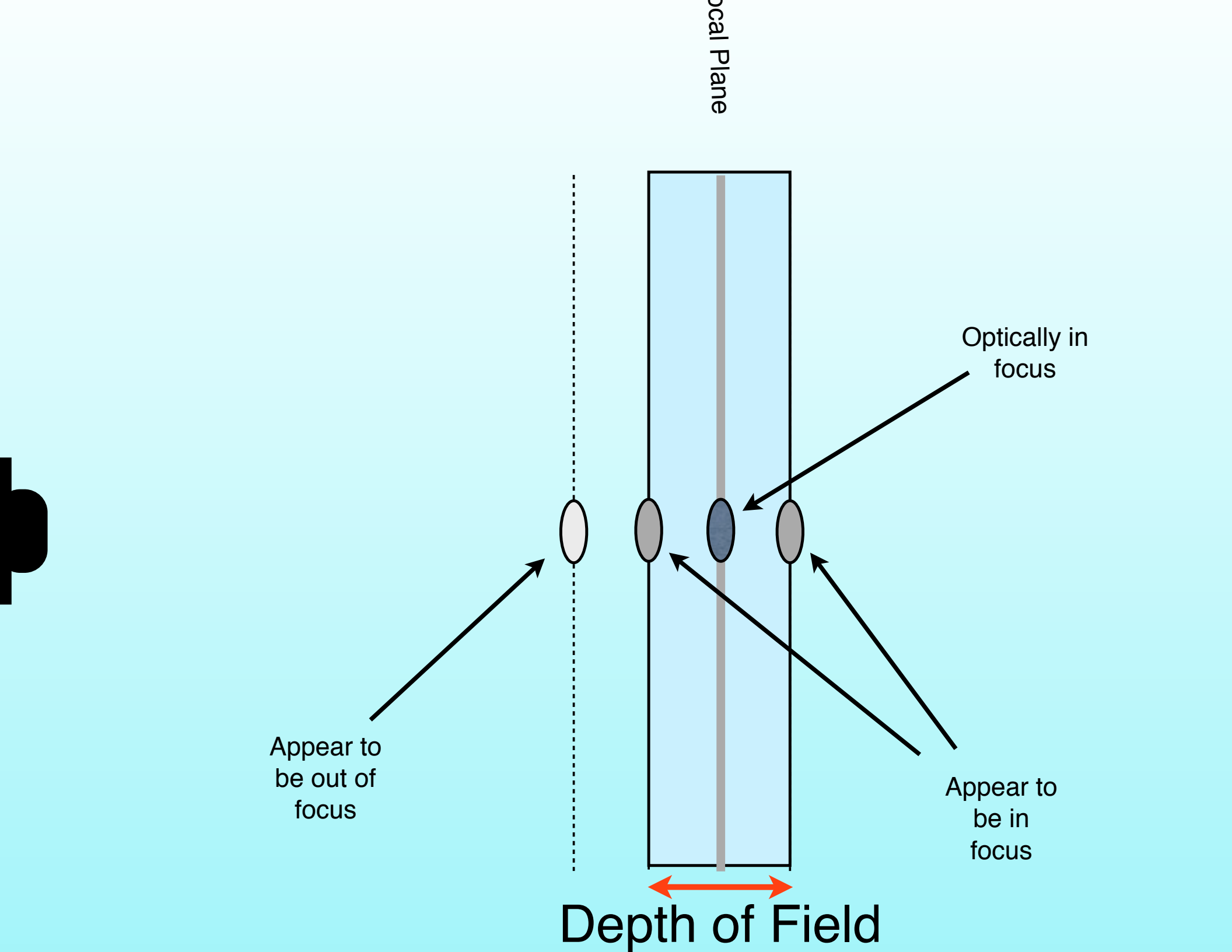
Side to side or top to bottom is easier to resolve because these points lie on the "in-focus" plane.

Some of the points on an object in front of and behind the focal point will also appear to be in foc because our eye can't resolve perfectly.

That distance from near to far in front of the lens where we can't resolve a difference in focus is the *depth of field (DOF)*.


Optically in
focus
ocal Plane


ocal Plane
Optically in focus
Appear to be in focus
Depth of Field


ocal Plane
Optically in focus
Appear to be out of focus
Appear to be in focus
Depth of Field

Depth of Field

Cameras don't affect DOF, lenses do.

Each lens has a depth of field range that is dependent on its apertures, focal length, zoom range, etc.

- Example: settings of 70mm and f8 on a 24-80m and 50-120mm zoom lens may have different DOFs.

Depth of Field

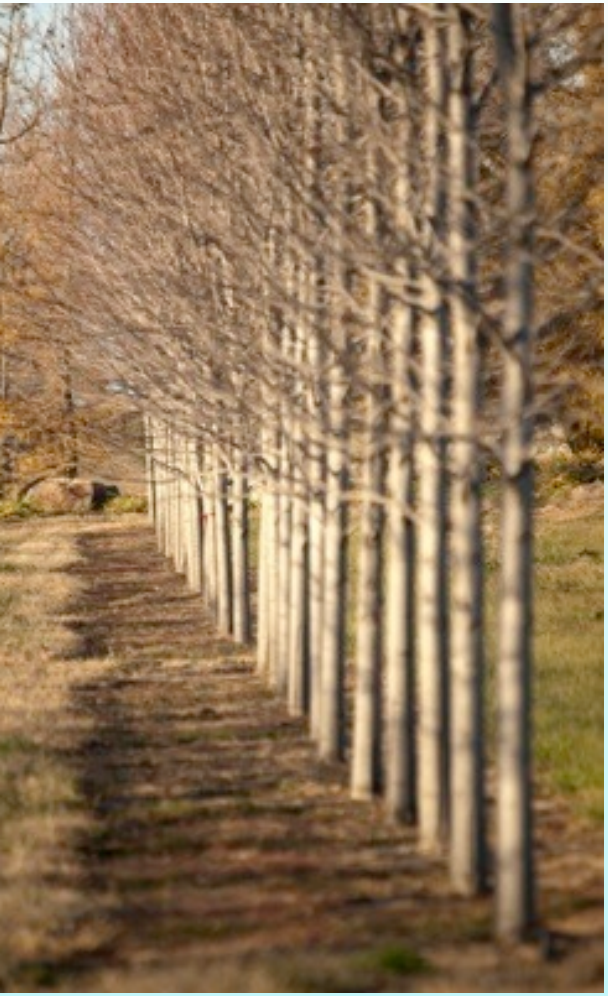
You can control the depth of field in your image

Narrow depths of field are used to emphasize a subject or create an artistic look to the image

Wide depths of field are used to show all subject in an image to be in focus, to emphasize the relati perspectives of the subjects.

All f/2.0 - Focal point on different blooms

Use DOF as a way to indicate what the viewer should look at first - our eye seeks out objects in focus first



f/3.5
istant focus

f/22
Mid focus

f/3.5
Near focus

Depth of Field

- For all lenses, a large aperture (small f/number) results in a *narrower* depth of field.
- For all lenses, a small aperture (large f/number) results in a *wider* depth of field.

Depth of Field

- Shorter focal length lenses have a wider depth of field than longer focal length at the same aperture (f/number).

Focal distance = 10 ft.

Lens	Aperture	Near "in-focus"	Far "in-focus"	DOF
35mm	f/8	7.7'	14'	6.3'
50mm	f/8	8.7'	11.7'	3'
100mm	f/8	9.6'	10.4'	0.8'

Depth of Field

- Because of the "crop factor" of smaller sensors, lenses on these cameras "appear" to have longer focal lengths, so their depth of field is narrower.
- The smaller the sensor, the narrower the depth field at the same aperture setting and subject distance.

Depth of Field

xample: Focus on subject 10 ft. from camera

- 50mm lens, f/8, full-frame sensor. DOF = 2.4 ft
- Same lens/aperture, APC sensor. DOF = 1.9 ft
- Same lens/aperture, Four-thirds sensor. DOF = 1.2 ft
- Same lens/aperture, point-and-shoot sensor. DOF = 0.4

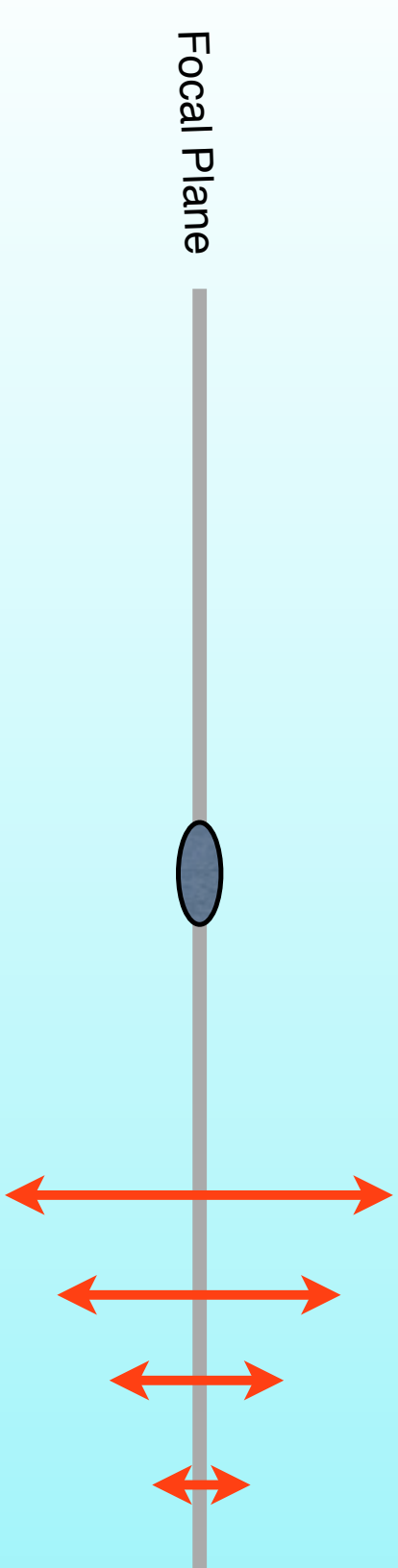
mm, f/8, 10 feet away

rame (35mm)

Frame (1.6x crop)

Frame (2x crop)

and-shoot

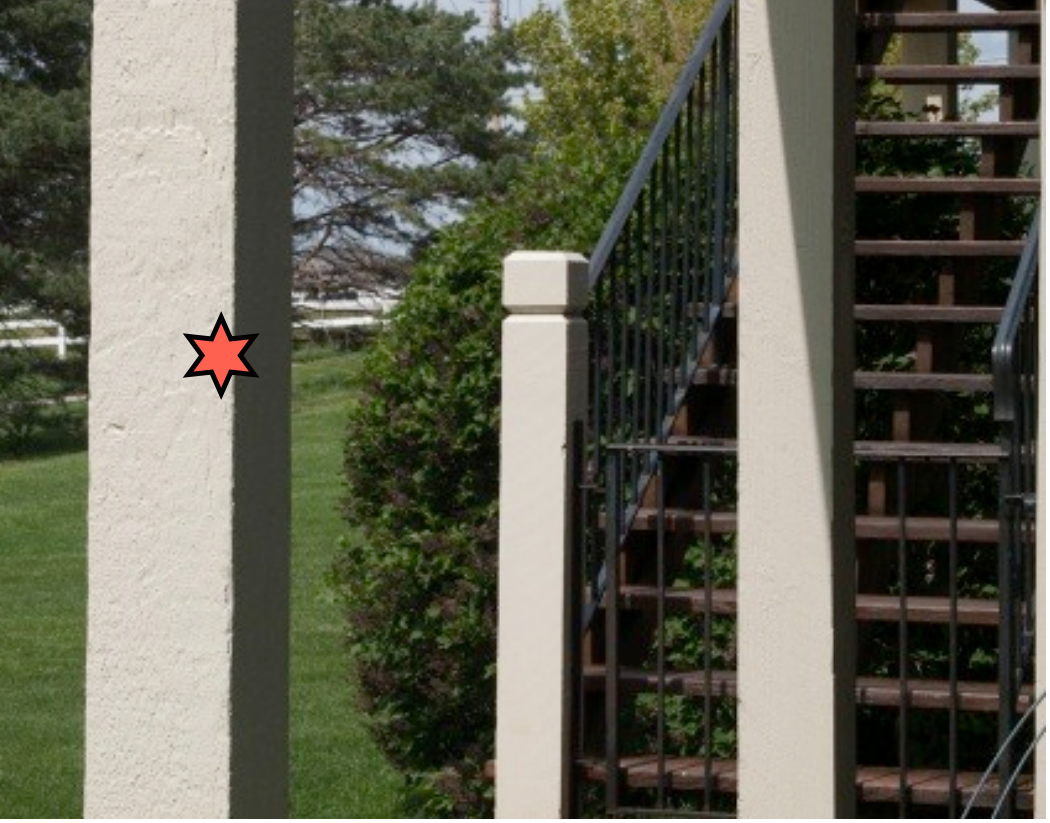


Depth of Field

DOF is also a function of the distance from the camera to the subject

For a given focal length/aperture setting, the shorter the distance between the camera and subject, the *narrower* the DOF.

Likewise, the longer the distance between camera and subject, the *wider* the DOF.



10 ft

f/20 for all

★ point of focu

5 ft

2 ft

10 ft

f/2 for all,

point of focu

5 ft

2 ft

Depth of Field

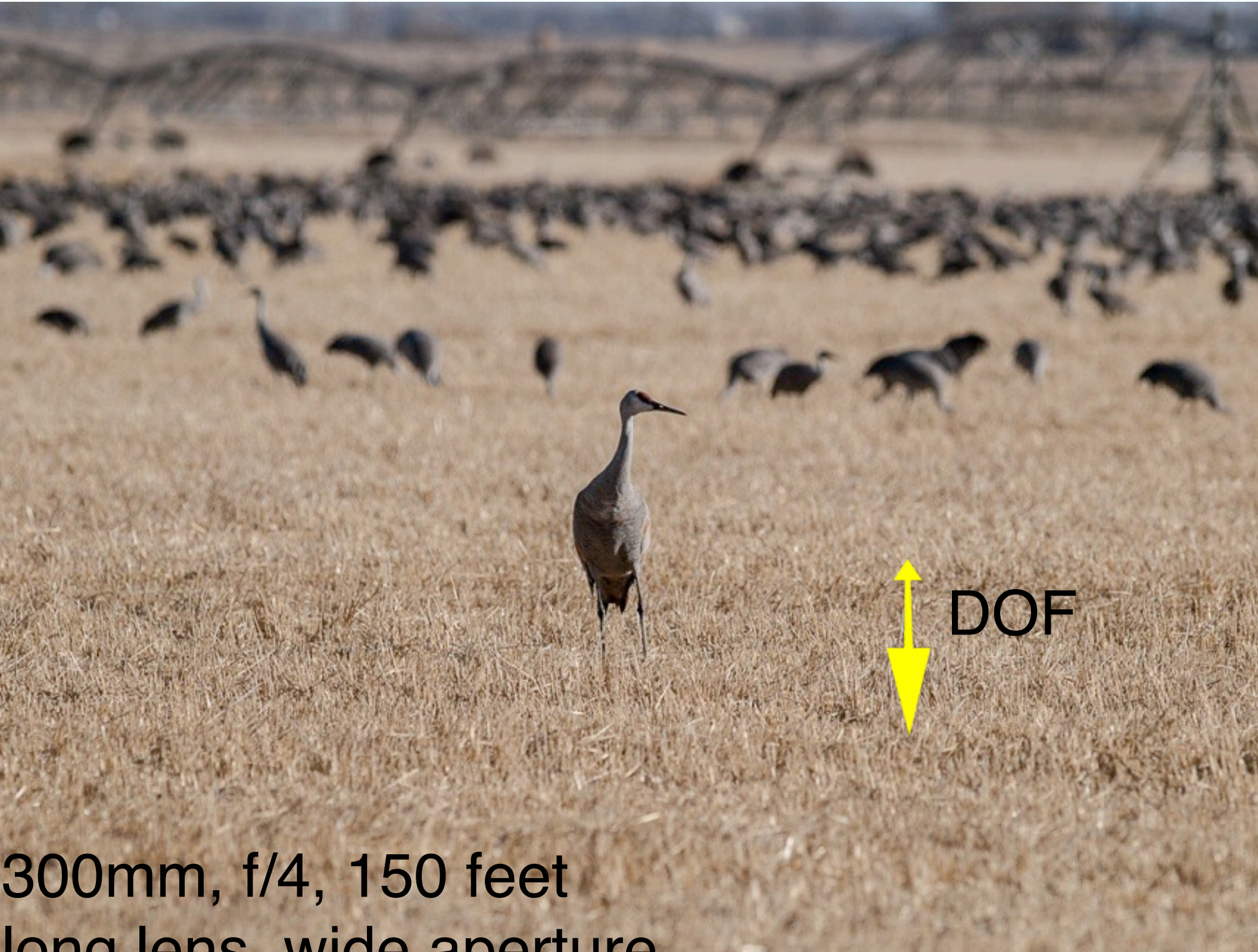
You, the photographer, decide how much DOF yo
need to make the image look the way you want.

There are options on how to achieve your desire
DOF.

Depth of Field

Narrower DOF:

- Open aperture (smaller f/numbers)
- Longer focal length lens
- Get closer to the subject
- Or combination of the above



300mm, f/4, 150 feet

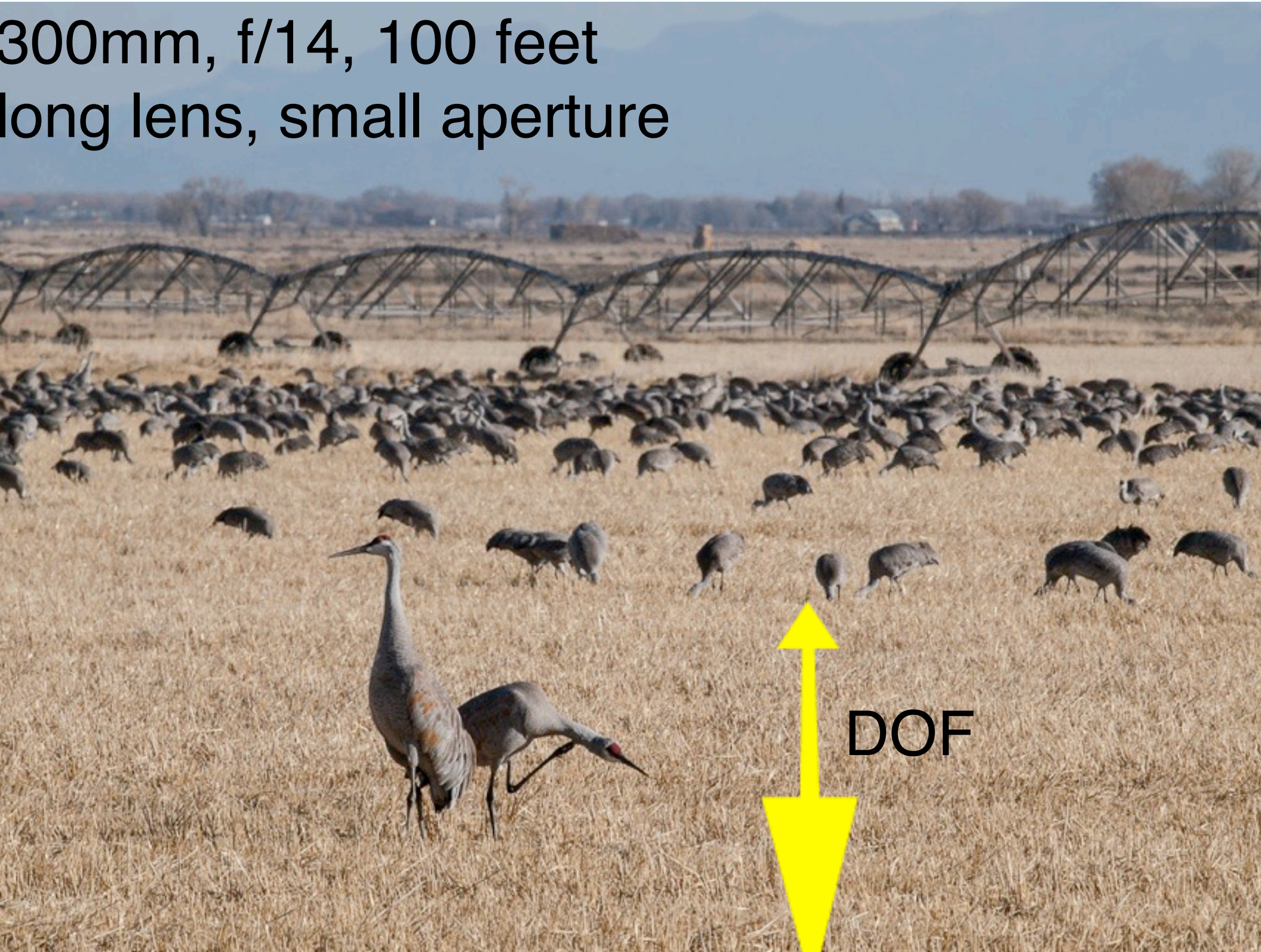
long lens, wide aperture

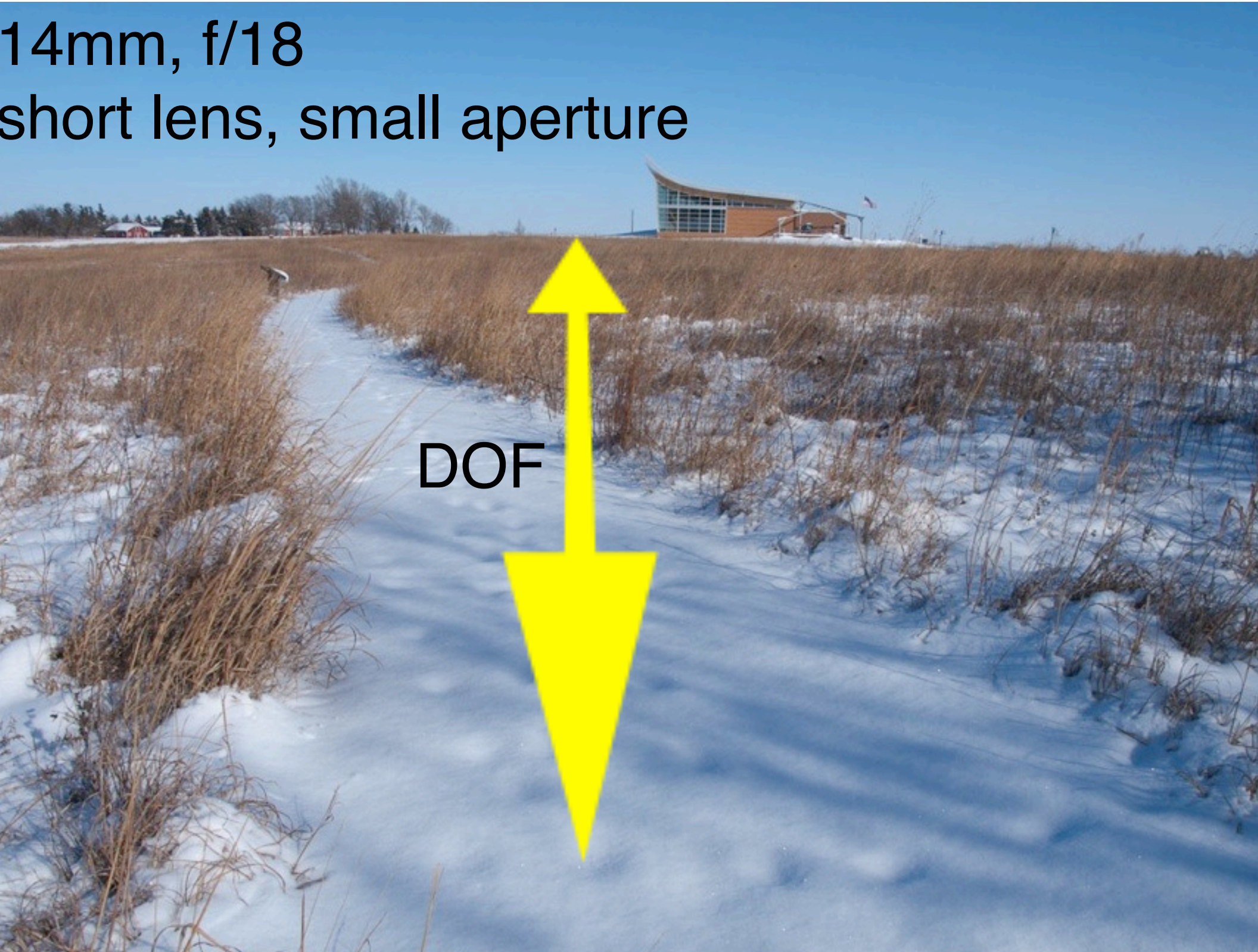
17mm, f/3.2, 2 feet
short lens, small aperture, close distance

Depth of Field

Wider DOF:

- Close aperture (larger f/numbers)
- Shorter focal length lens
- Move farther from your subject
- Or combination of the above


300mm, f/14, 100 feet
long lens, small aperture
DOF


14mm, f/18
short lens, small aperture
DOF

How do I get maximum DOF?

Hyperfocal Distance

When the lens is focused on the hyperfocal distance, the depth of field extends from half hyperfocal distance to infinity.

Photography, Phil Davis, 1972.

The hyperfocal distance is the point of focus where everything from half that distance to infinity falls within the depth of field.

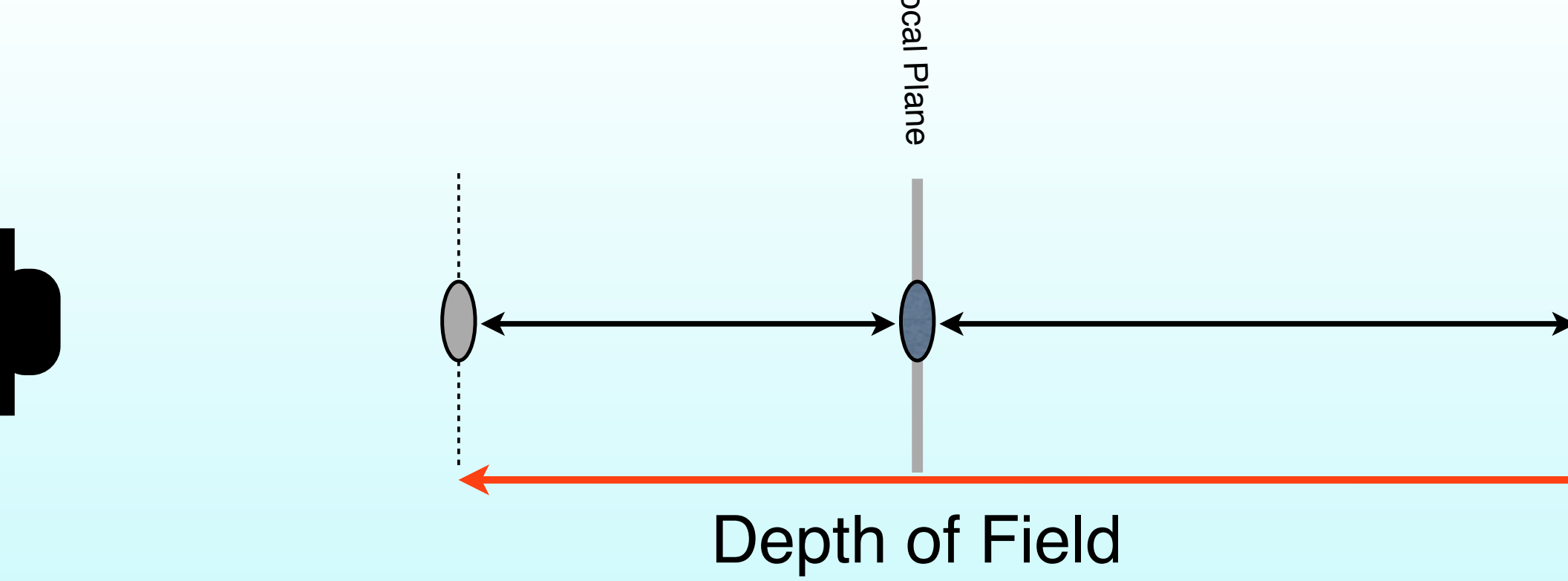
John Shaw's Landscape Photography, John Shaw, 1994.

... the *hyperfocal distance setting* ... is simply a fancy term that means the *distance setting* any aperture that produces the *greatest depth of field*.

How to Use Your Camera, New York Institute of Photography, 2000.

From: www.dofmaster.com

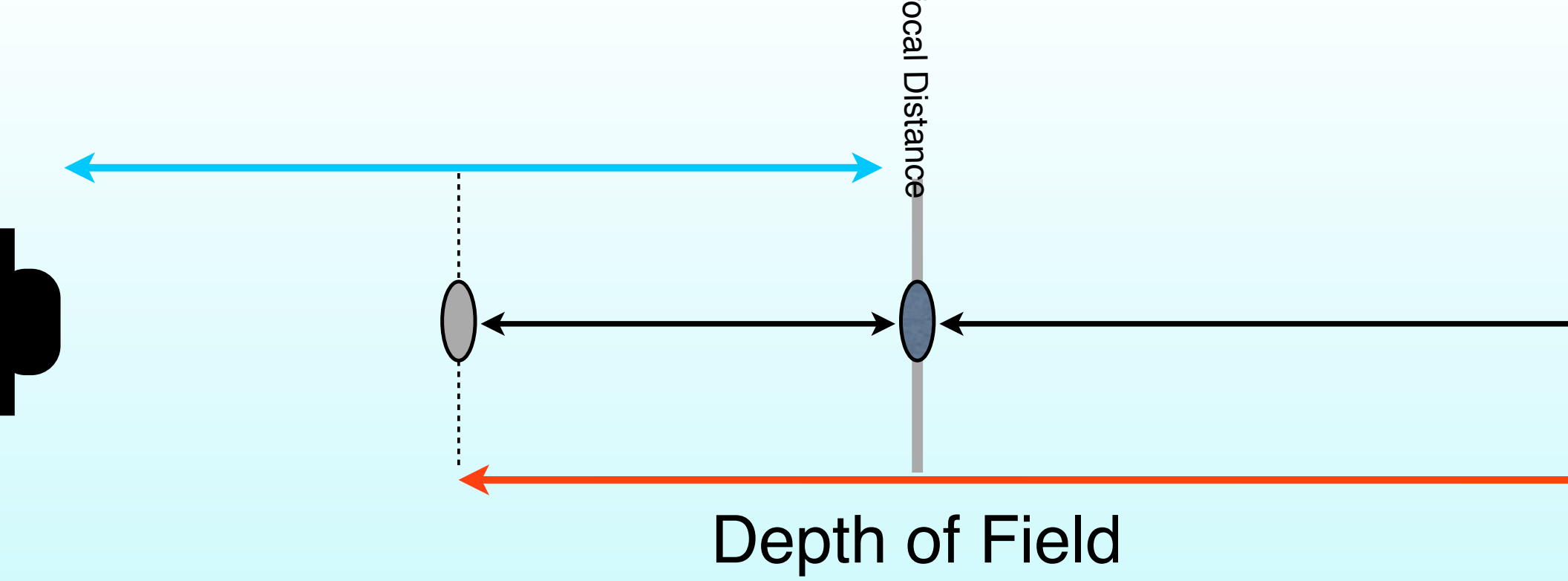
Huh??



pth of Field is not equal around the focal plane - 2/3rds is behind a
rd is in front.

e **hyperfocal** distance is simply the point you focus on in order to
vide the *maximum* amount of DOF for the lens, aperture and dista
nbination.

dscape photographers use this the most; portrait photographers



hen the camera is <u>focused at the **hyperfocal** distance</u>,
DOF will extend from a point halfway between the
mera and the point of focus, to infinity.

e **hyperfocal** distance is a function of lens focal length
d aperture setting. Shorter lenses have a hyperfocal
tance close to the subject; longer lenses have a point

Hyperfocal Distance

- *Examples:*
- Canon 5D, 35mm lens, f/16, subject distance 500 feet; hyperfocal distance = 493 feet
  - Everything from 7 feet to infinity will be in the DOF
- Canon 5D, 200mm lens, f/16, subject distance 500 feet; hyperfocal distance = 342 feet
  - Everything from 158 feet to infinity will be in the DOF

Hyperfocal Distance

Due to the narrower DOF for long lenses, some aperture settings may result in a DOF that doesn't include infinity.

Canon 5D, 200mm lens, f/16, subject distance 500 fe
- hyperfocal distance = 493 feet

- Everything from 158 feet to infinity will be in the DOF

Canon 5D, 200mm lens, f/5.6, subject distance 500 fe
- hyperfocal distance = 215 feet

- Everything from 285 feet to 2057 feet will be in the DOF

Depth of Field

- *Just another tool available for you to use in order to express your vision for a composition in your image.*
- *Your next step is to play around with your lenses to learn h images look with different depths of field.*
- *Then select the look you want for your images and use thos settings when you want to give your photographs your personal touch.*

Questions?