

# BASICS OF DIGITAL PHOTOGRAPHY

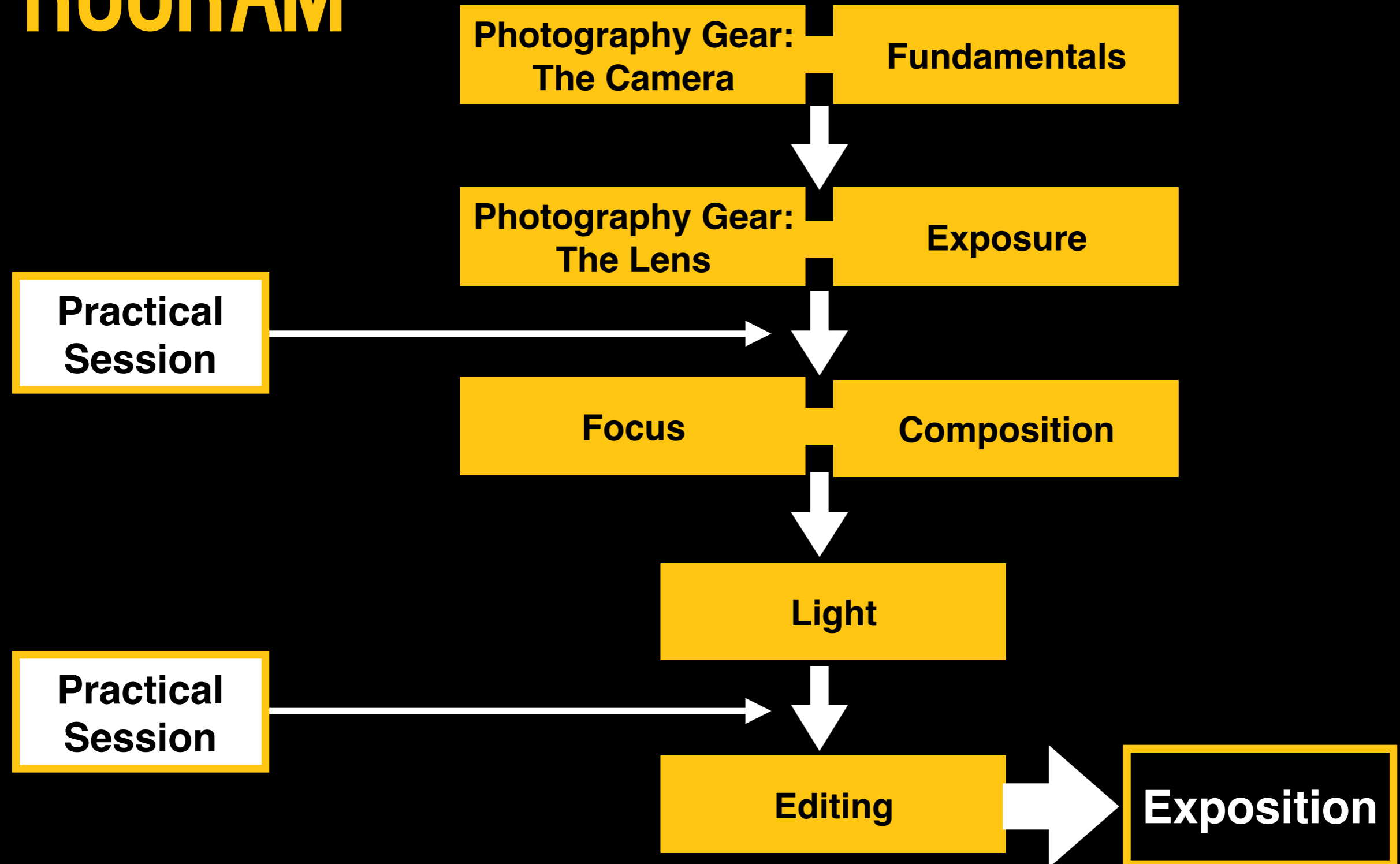
*Fahad Golra*, discussing the fundamental concepts of photography



# BASICS OF DIGITAL PHOTOGRAPHY

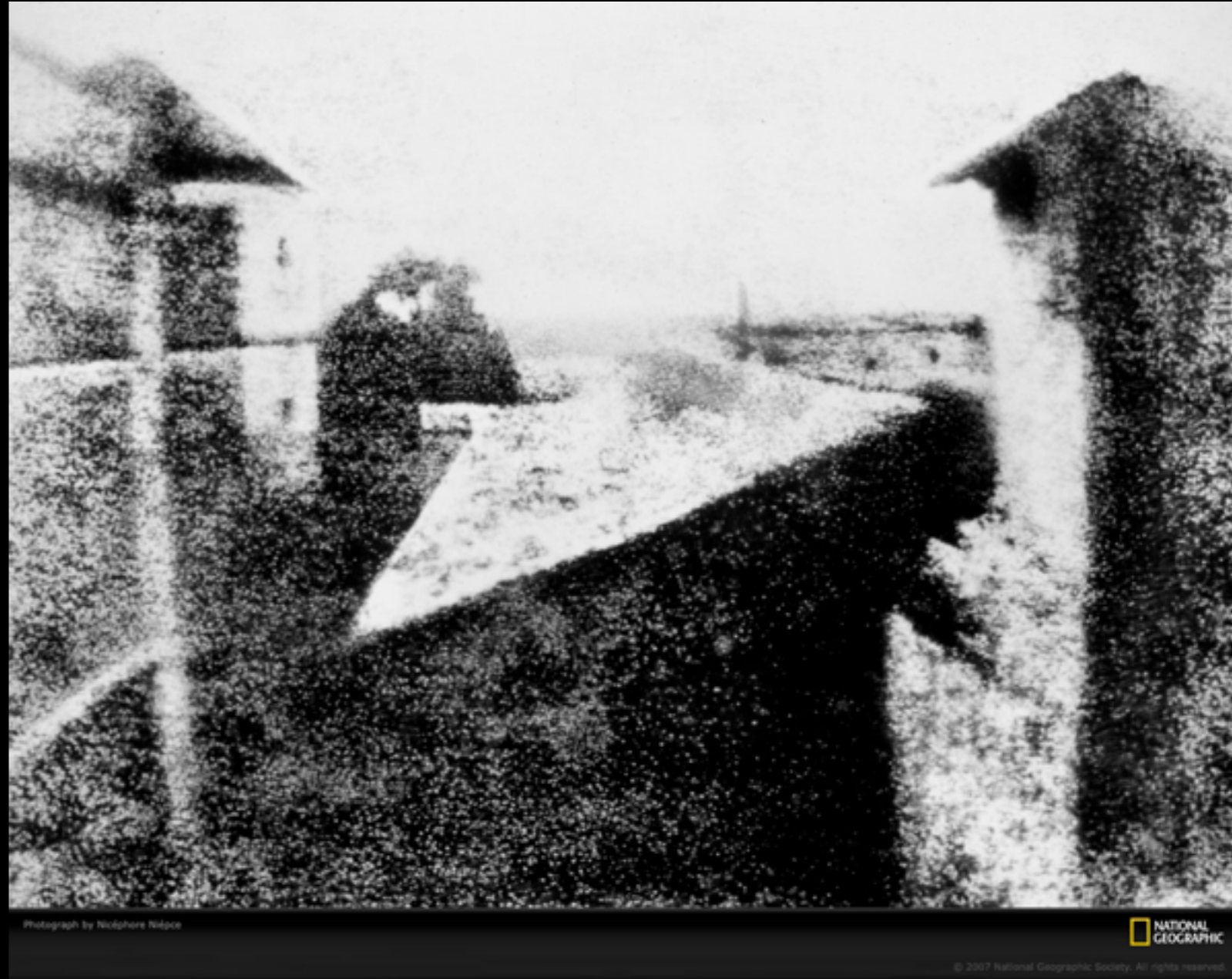
# Welcome !!!

# WORKSHOP PROGRAM



# WORLD'S FIRST PHOTOGRAPH

- France, 1826
- Photograph by Joseph Nicéphore Niépce, 1826
- Exposing a bitumen-coated plate in a camera obscura



Photograph by Nicéphore Niépce

Image Source: National Geographic



# Photography Gear: The Camera



# HUMAN VISION

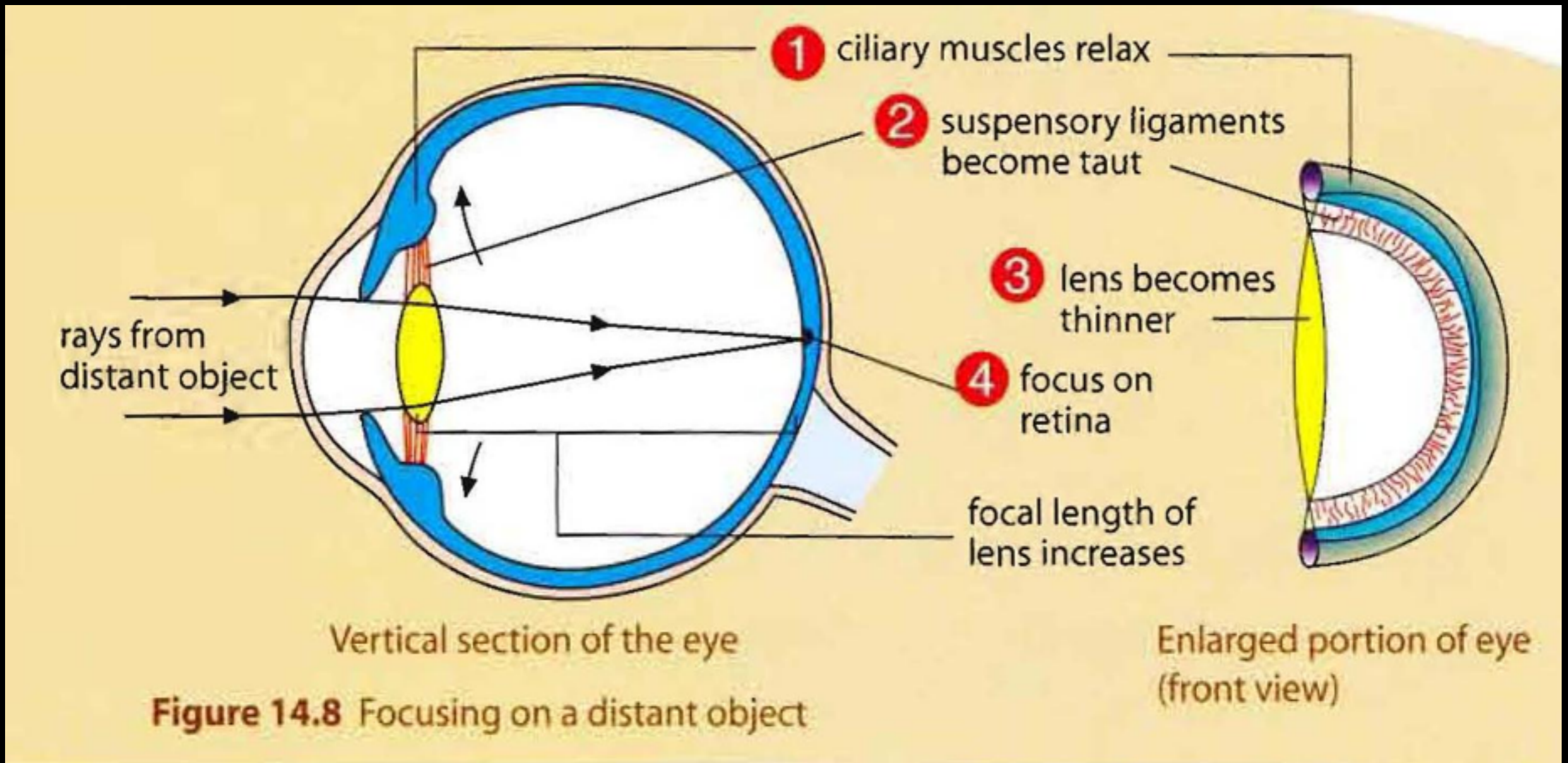


Image Source: <https://humaneyeproject.files.wordpress.com>



# IMAGE FORMATION

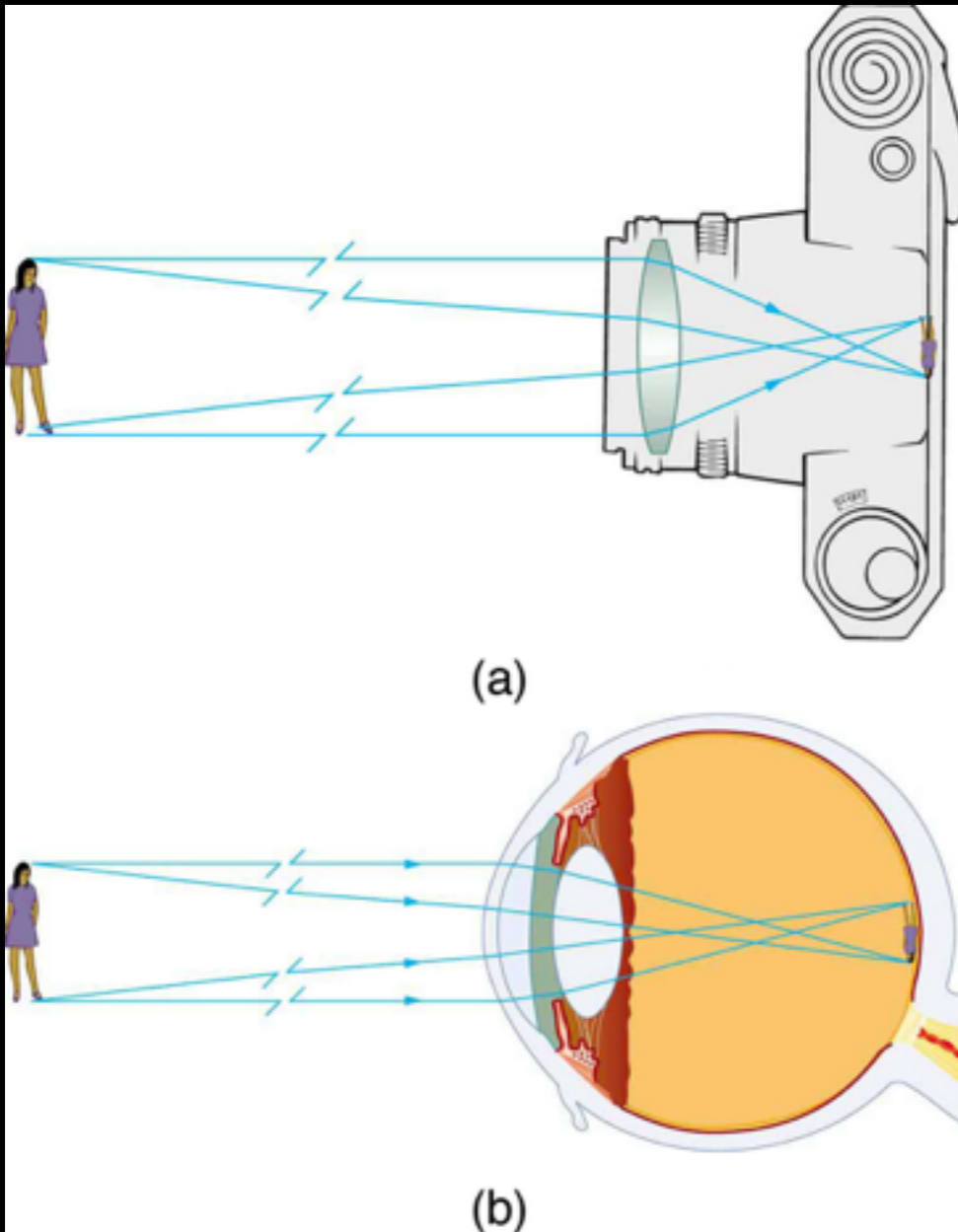


Image Source: <https://voer.edu.vn>

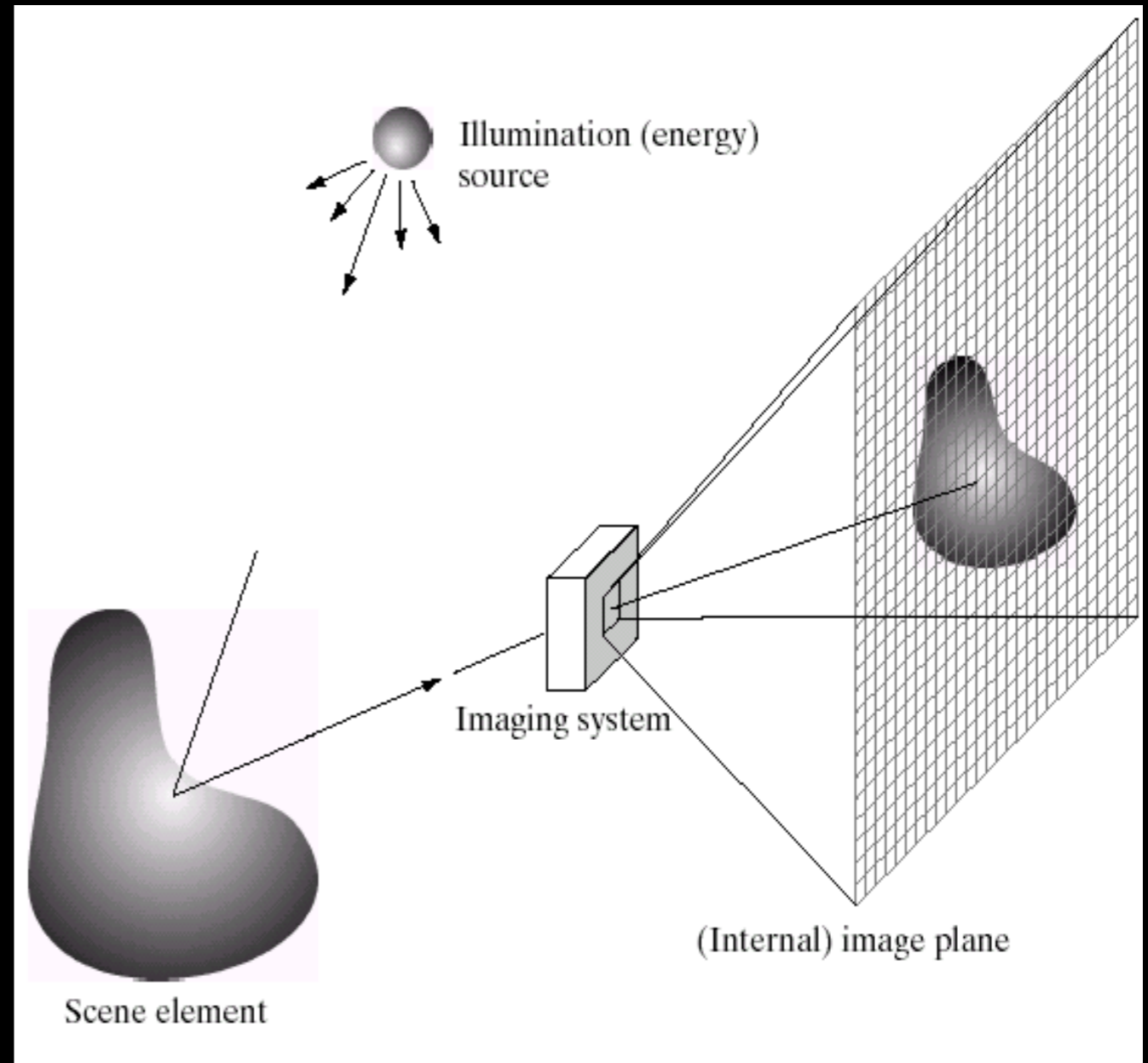
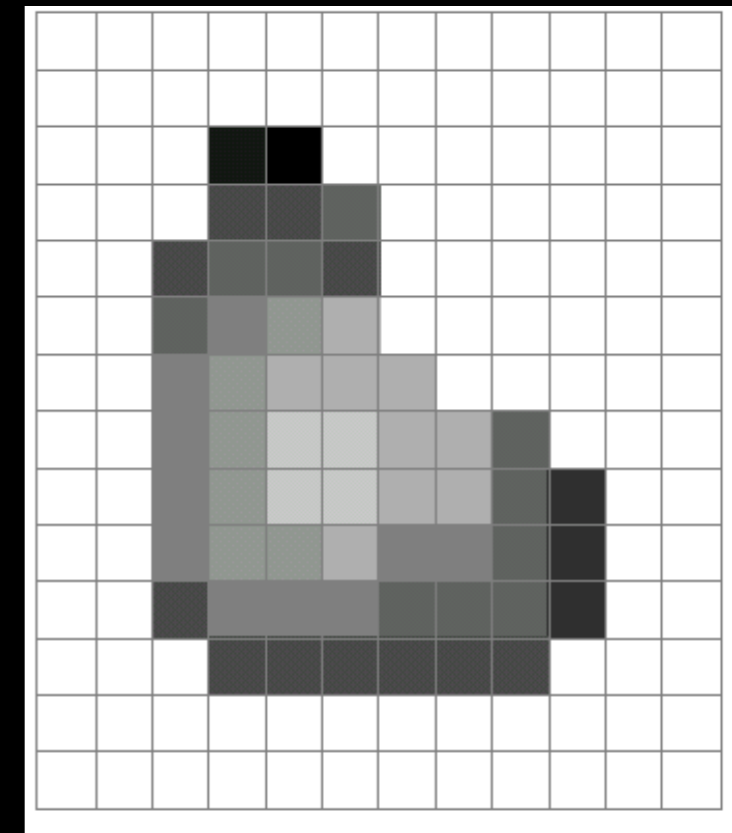
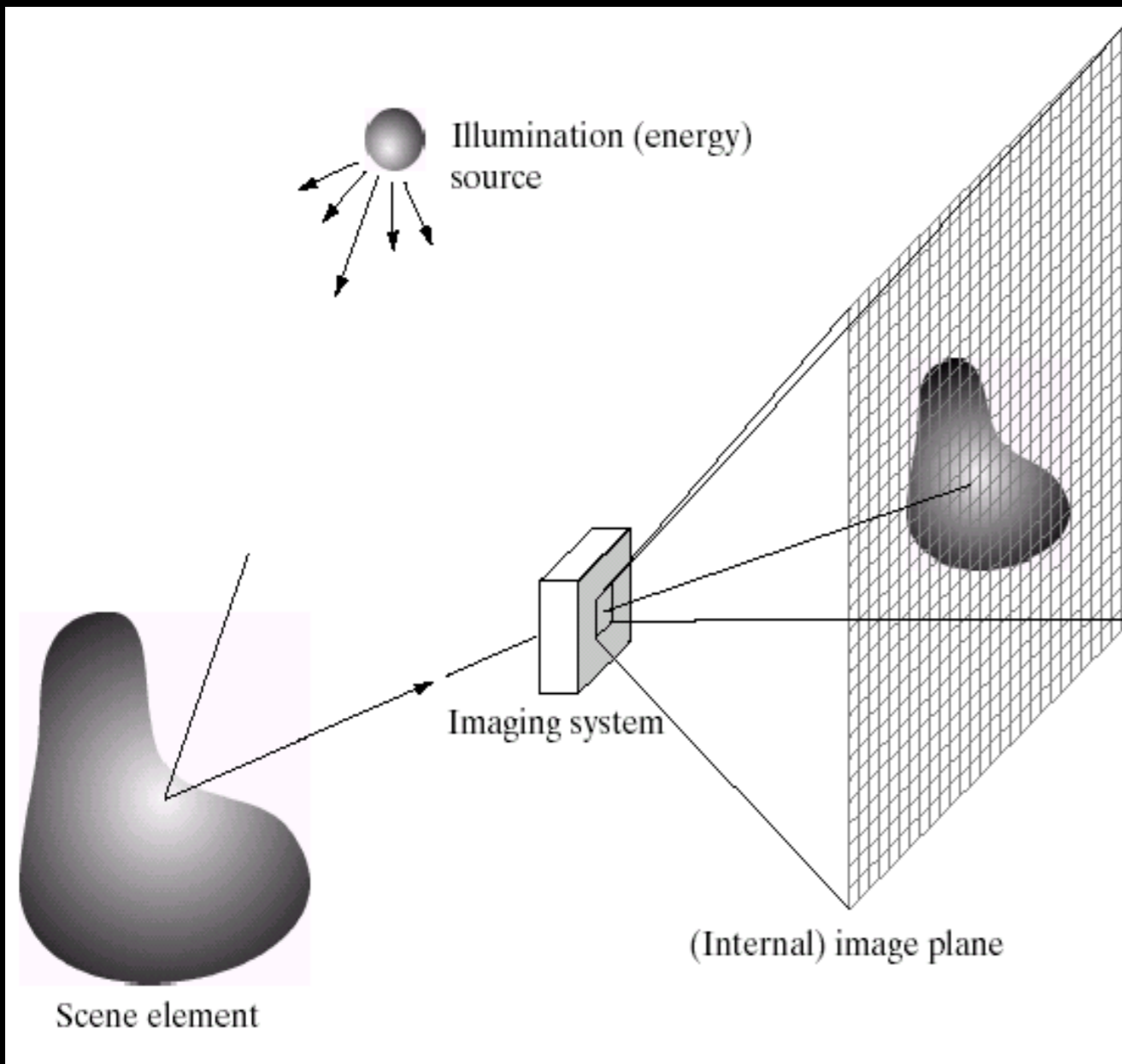


Image Source: Jennifer Rexford, Princeton University



# IMAGE FORMATION



**Digital Image**

Images Source: Jennifer Rexford, Princeton University





# DIGITAL SENSORS



Full Frame



APS



APS-C



Four-thirds



CX



1/3"

- The most important difference between these cameras is not the Megapixels, it is the

## Sensor Size

# DIGITAL SENSORS



Full Frame



APS



APS-C



Four-thirds



CX



1/3"

## Bigger Sensor

Bigger pixels

More pixels !!!

Better Imaging

## Smaller Sensor

Smaller camera

Less money

Better manoeuvrability

# DIGITAL SENSORS



Full Frame



APS



APS-C



Four-thirds



CX



1/3"

36 x 24mm

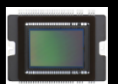
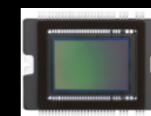
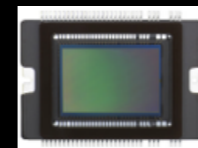
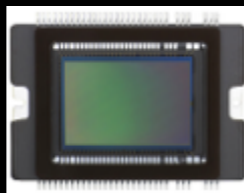
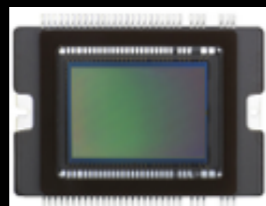
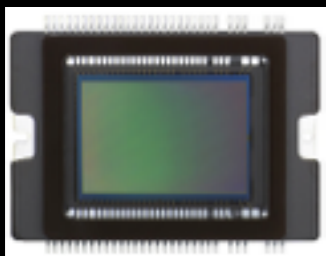
24 x 16mm

22 x 15mm

17 x 13mm

13 x 9mm

5 x 4mm



1.0X

1.5X

1.6X

2X

3X

7X



35mm

$$36 \div 24 = 1.5$$



# DIGITAL SENSORS



Full Frame



APS



APS-C



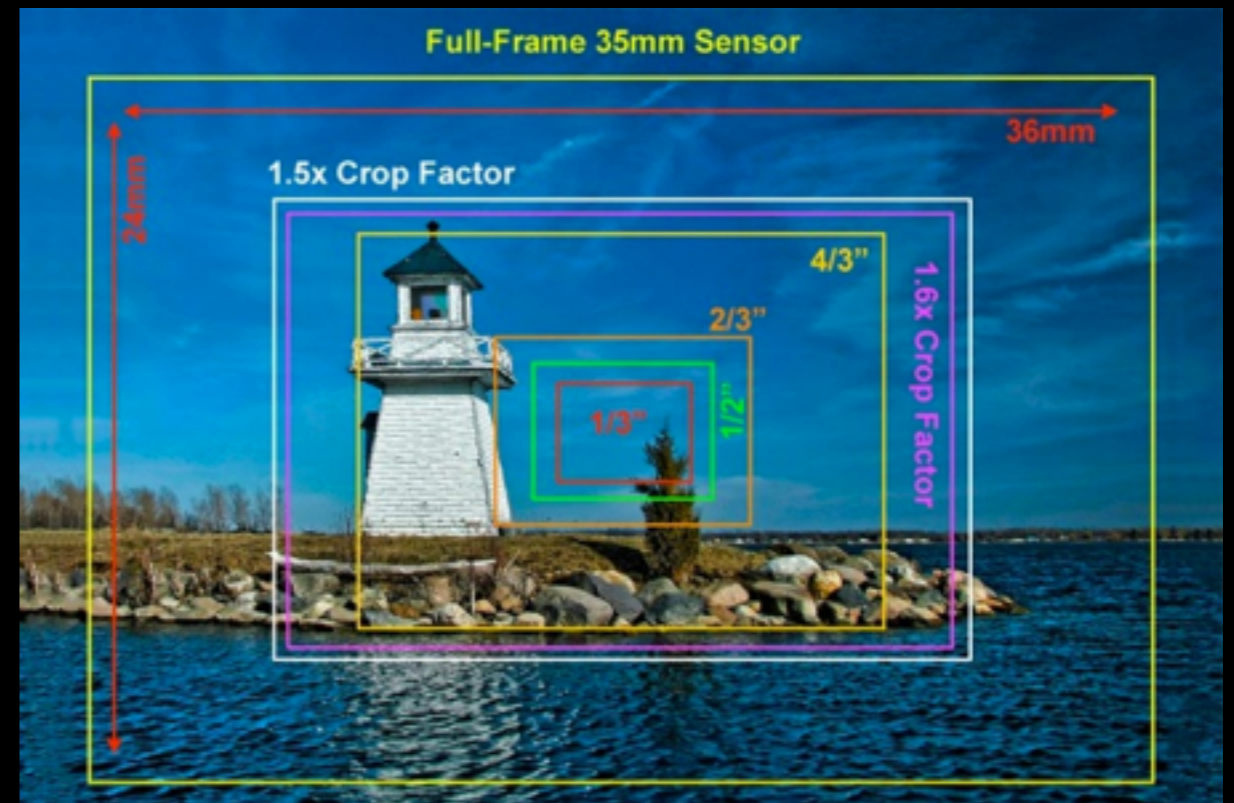
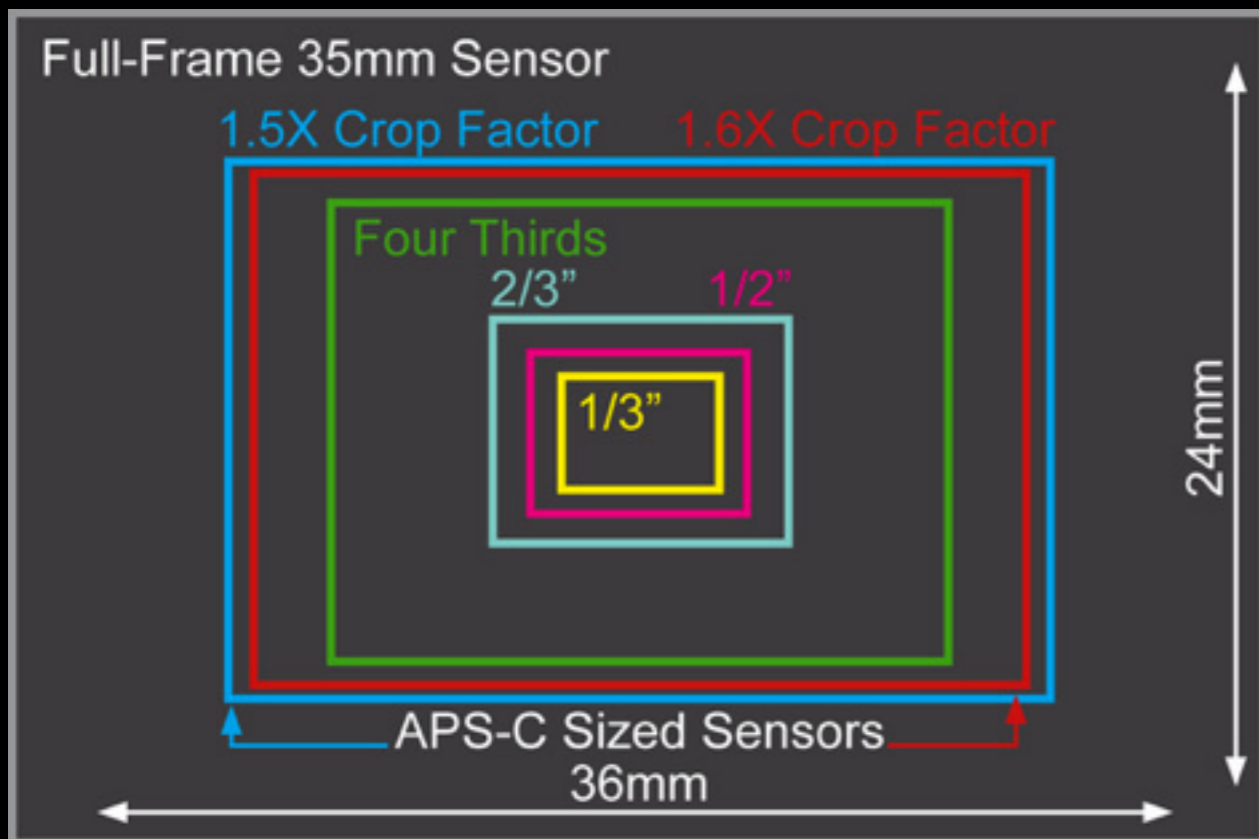
Four-thirds



CX



1/3"



# DIGITAL SENSORS



Full Frame



APS



APS-C



Four-thirds

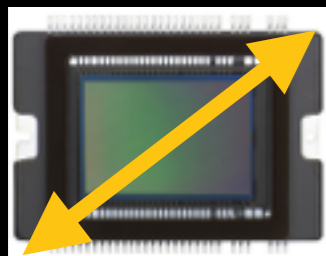


CX



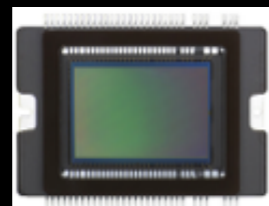
1/3"

36 x 24mm



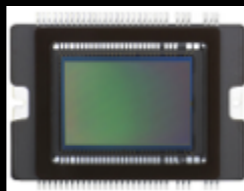
43 mm

24 x 16mm



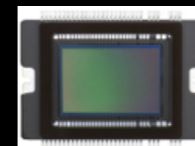
28 mm

22 x 15mm



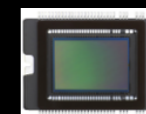
27 mm

17 x 13mm



22 mm

13 x 9mm



16 mm

5 x 4mm



6 mm



# DIGITAL SENSORS



Full Frame



APS



APS-C



Four-thirds



CX



1/3"

36 x 24mm

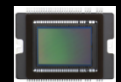
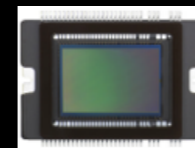
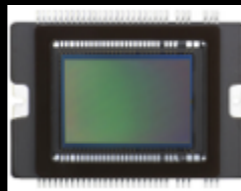
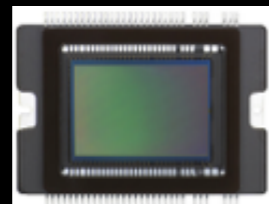
24 x 16mm

22 x 15mm

17 x 13mm

13 x 9mm

5 x 4mm



43 mm

28 mm

27 mm

22 mm

16 mm

6 mm

Sensor size x 1 = **Normal** Lens

Sensor size x 4 = **Sports** Lens

Sensor size % 2 = **Landscape** Lens

Sensor size x 8 = **Wildlife** Lens

Sensor size x 2 = **Portrait** Lens



# DIGITAL SENSORS



Full Frame



APS



APS-C



Four-thirds



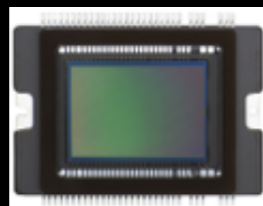
CX



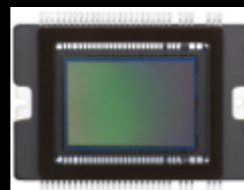
1/3"



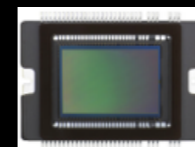
43 mm



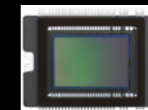
28 mm



27 mm



22 mm



16 mm



6 mm

Canon  
Nikon (FX)  
Sony  
Leica

Nikon (DX)  
Pentax  
Fuji  
Sony  
Samsung

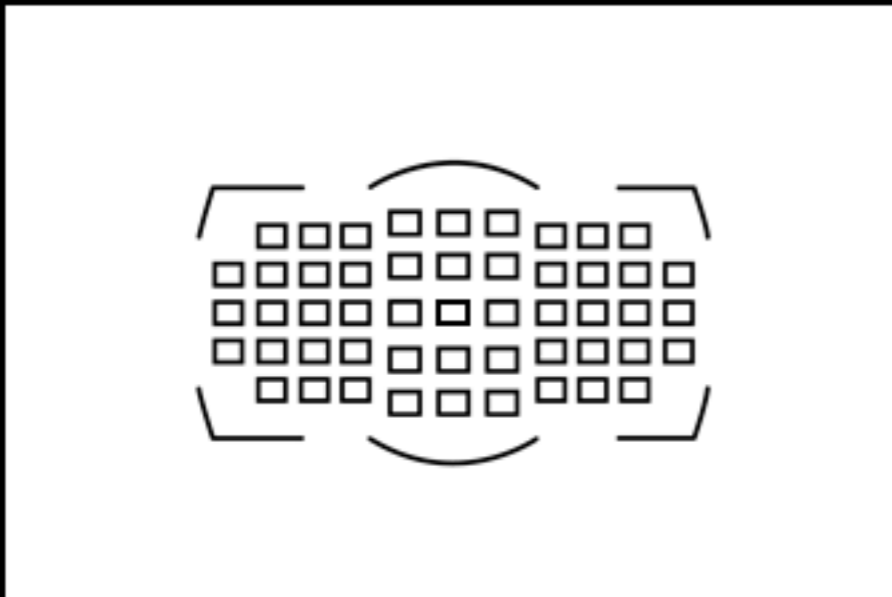
Canon(DX)

Panasonic  
Olympus



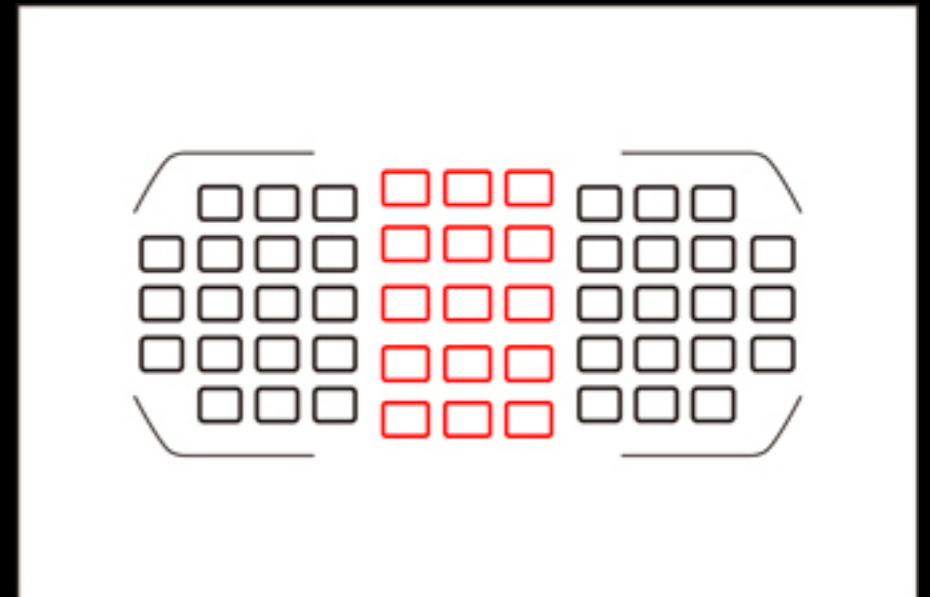
# FOCUSING POINTS

## Nikon D4s (FX)



- Mostly in the centre of Frame
- Precision through center

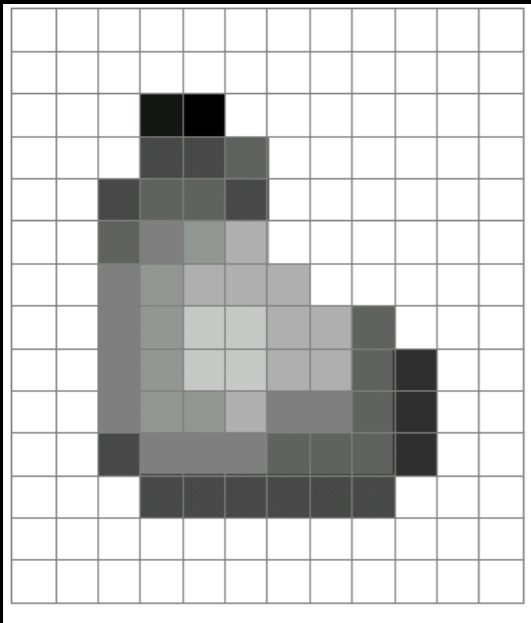
## Nikon D7100 (DX)



- Cover the image area

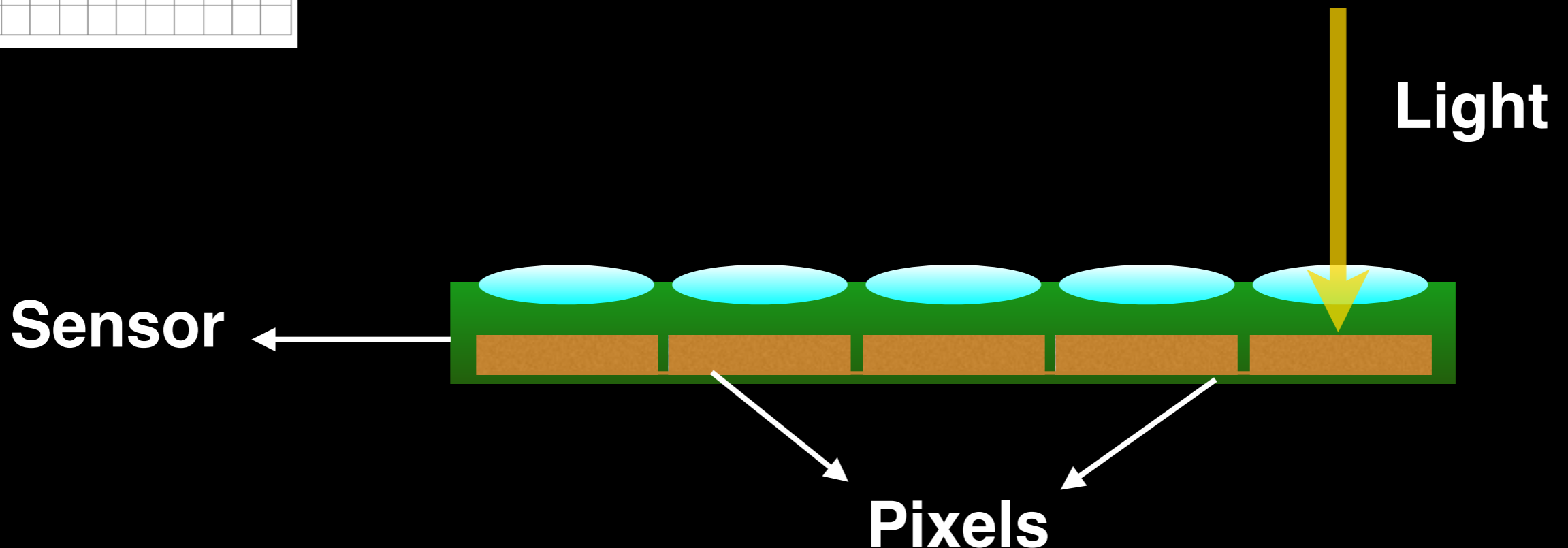


# WHAT IS A PIXEL?



**P**icture **E**lement = Pixel

Pixel = Light Sensitive Cell



# WHAT IS A PIXEL?

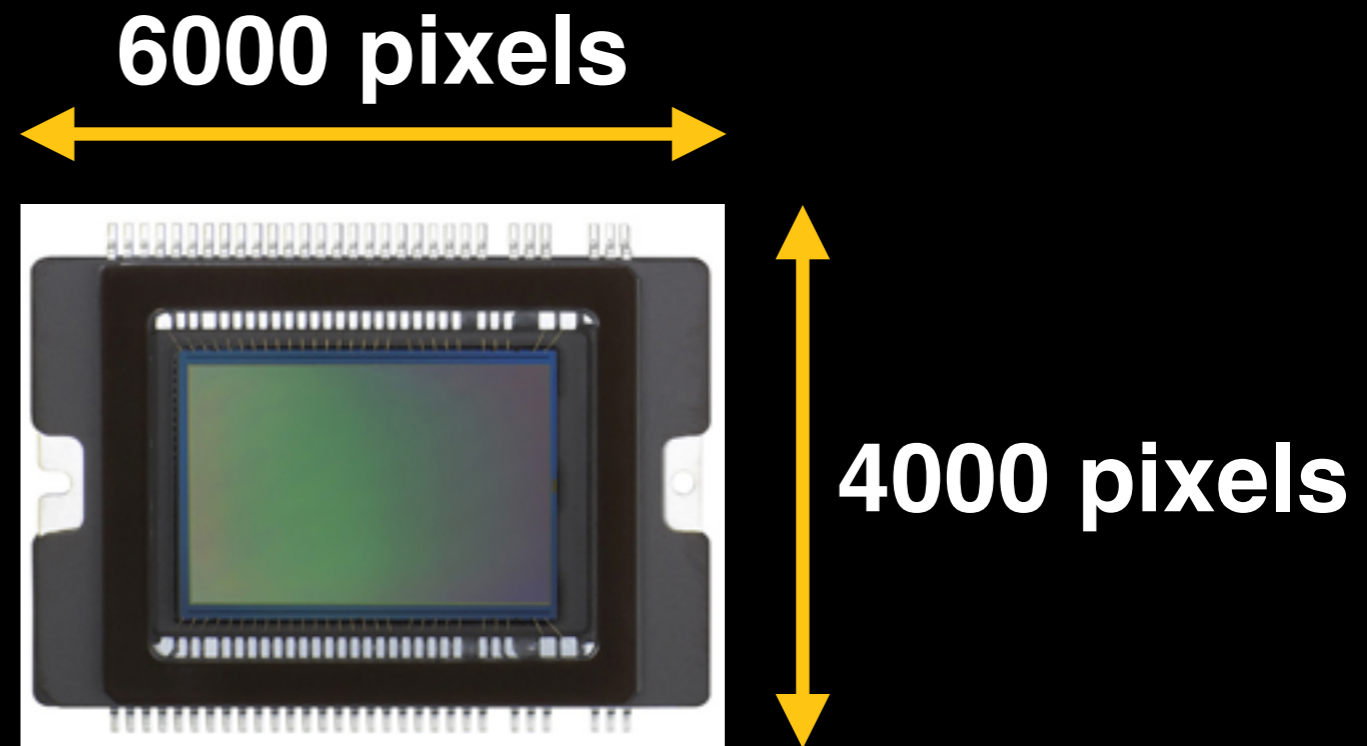
What matters is

**Quantity**

**Size**

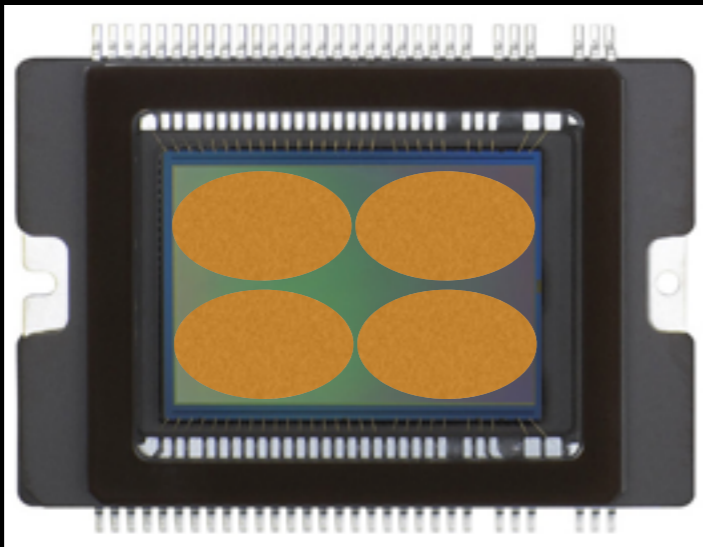
**Quality**

**24 Megapixel  
Sensor**

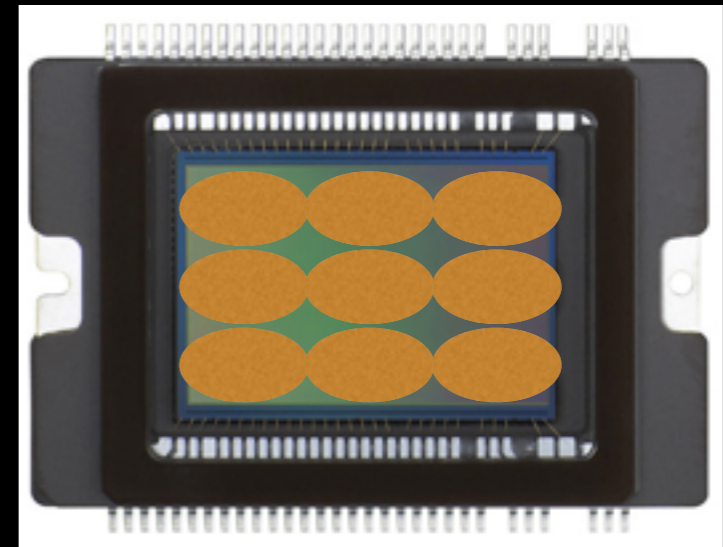


# PIXEL QUANTITY

$$2 \times 2 = 4$$



$$3 \times 3 = 9$$



**Pixel count increase (4 to 9) = 125%**

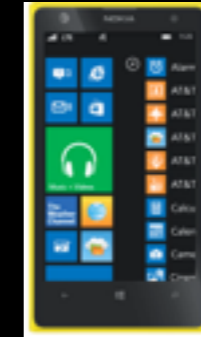
**Resolution increase (2 to 3) = 50%**

# PIXEL SIZE



**Nikon D810**

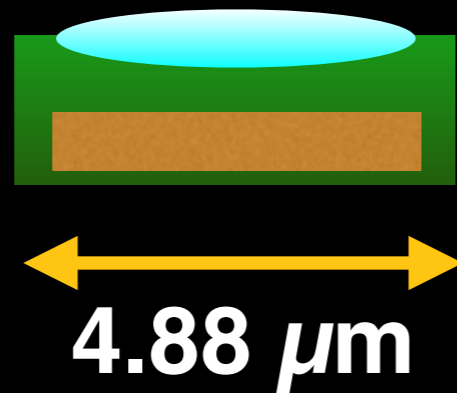
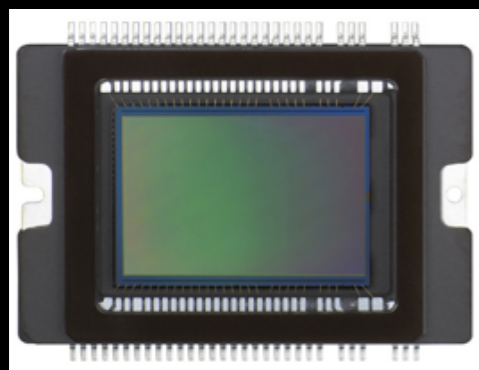
**36 Megapixles**



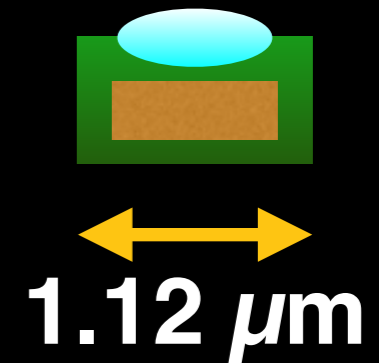
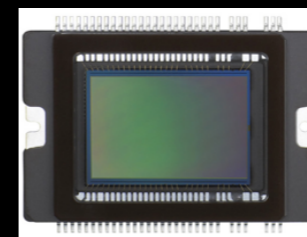
**Nokia Lumia 1020**

**41 Megapixles**

**43mm**



**11mm**



# WHAT TO GET?



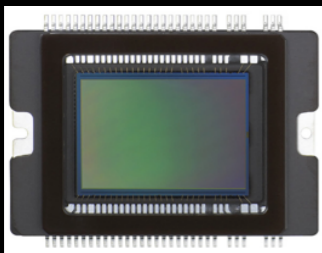
Full Frame



APS-C



CX

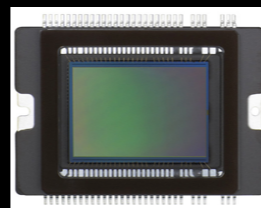


## Nikon D4s

16.1 MP

1,180g

4,100 EUR

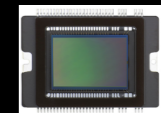


## Nikon D7100

24.1 MP

675g

900 EUR



## Nikon V3

18.1 MP

324g

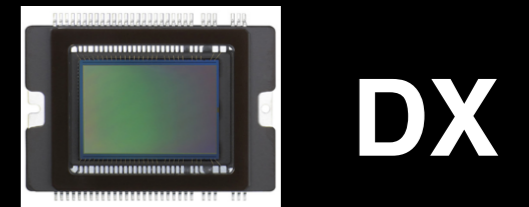
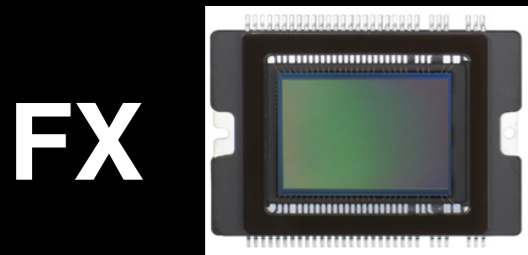
700 EUR



# WHAT TO GET DX OR FX?



300 x  
1.5 =  
450



**500 f/4**  
**3,880g**  
**15.4 inches**  
**7,200 euros**

**300 f/4**  
**1,440g**  
**8.8 inches**  
**1,050 euros**



# Fundamentals of Photography



# IT'S ABOUT LIGHT!

Photography is based on light



**Exposure** is the total amount of light allowed to fall on the film/image sensor





# EXPOSURE OVER OR UNDER?

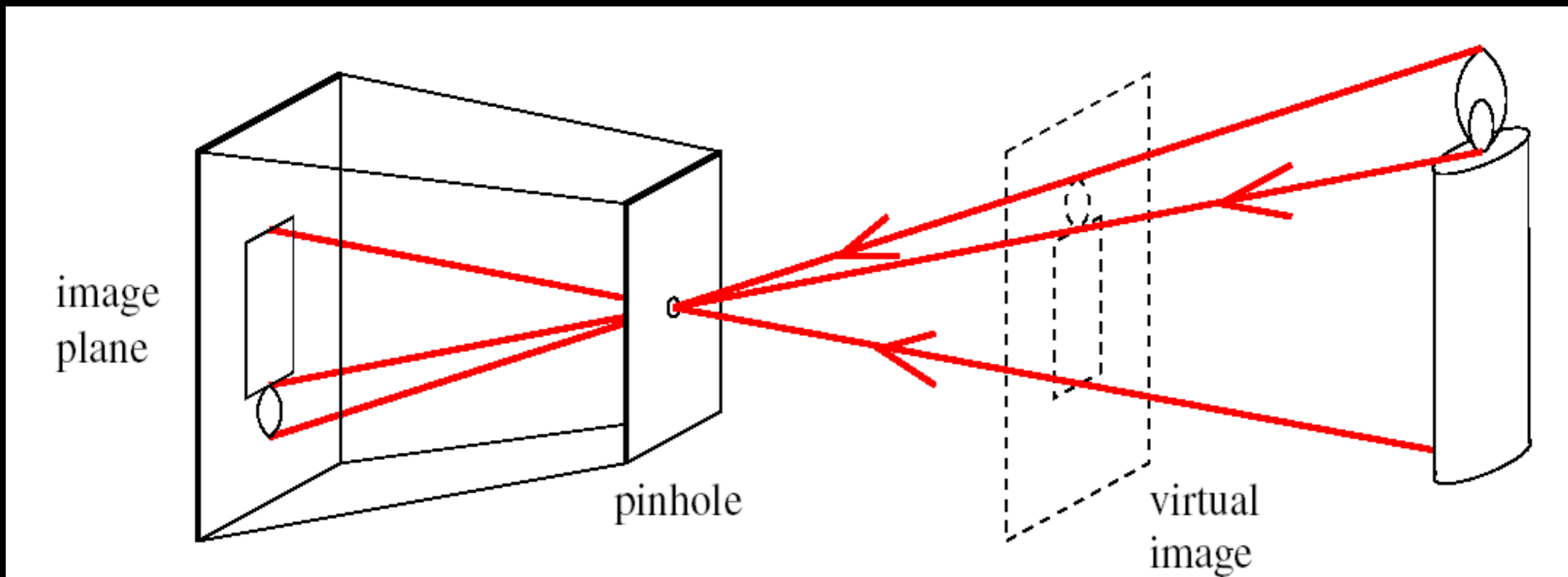


- Too much light creates an over bright image
- Lot of white spots
- Parts of image **Over-Exposed**

- Too little light creates an under bright image
- Lot of black spots
- Parts of image **Under-Exposed**



# PINHOLE CAMERA



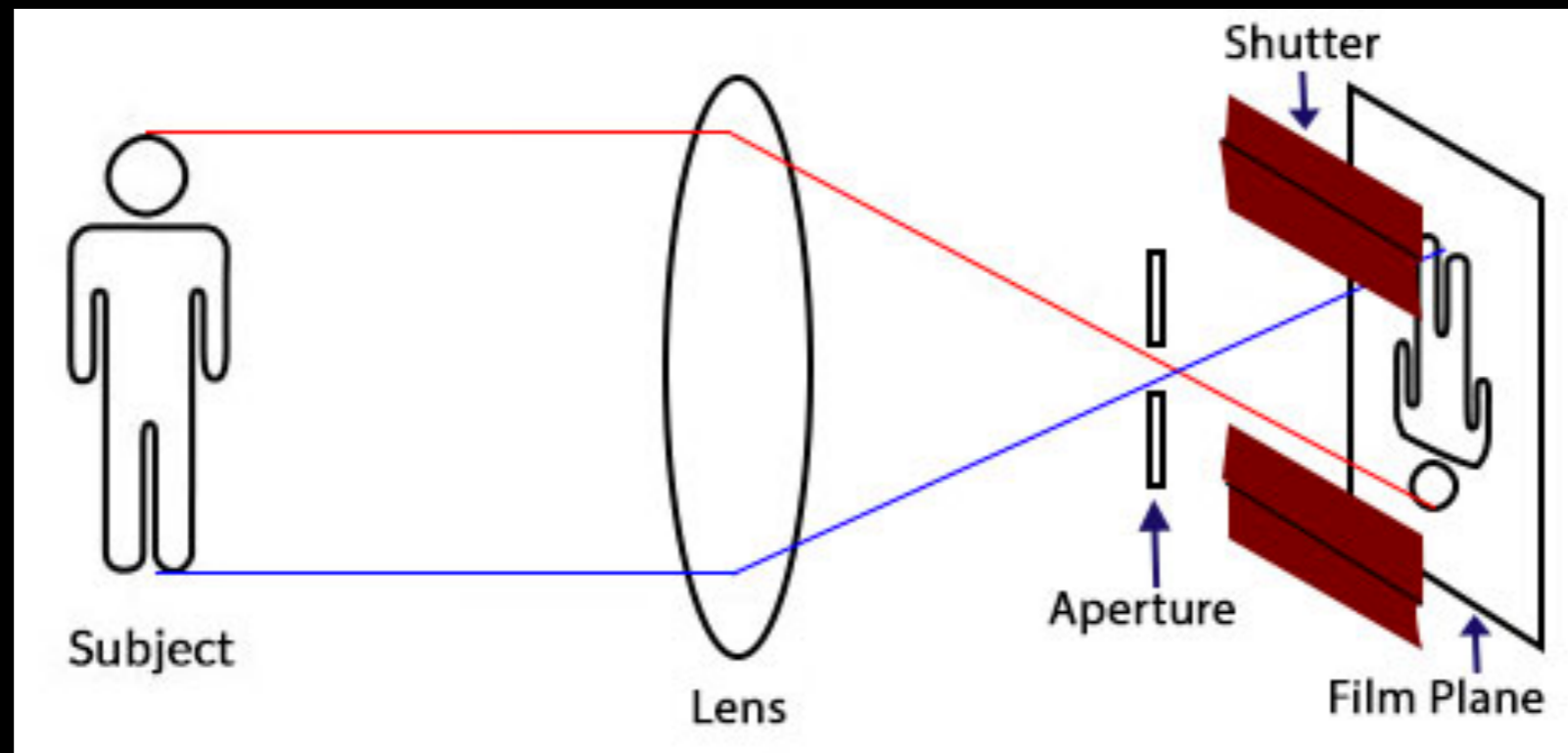
**Size of hole and duration of opening  
determines the amount of allowed light**

# CONTROLLING EXPOSURE

- *Mainly* two things let us control the exposure

Aperture

...

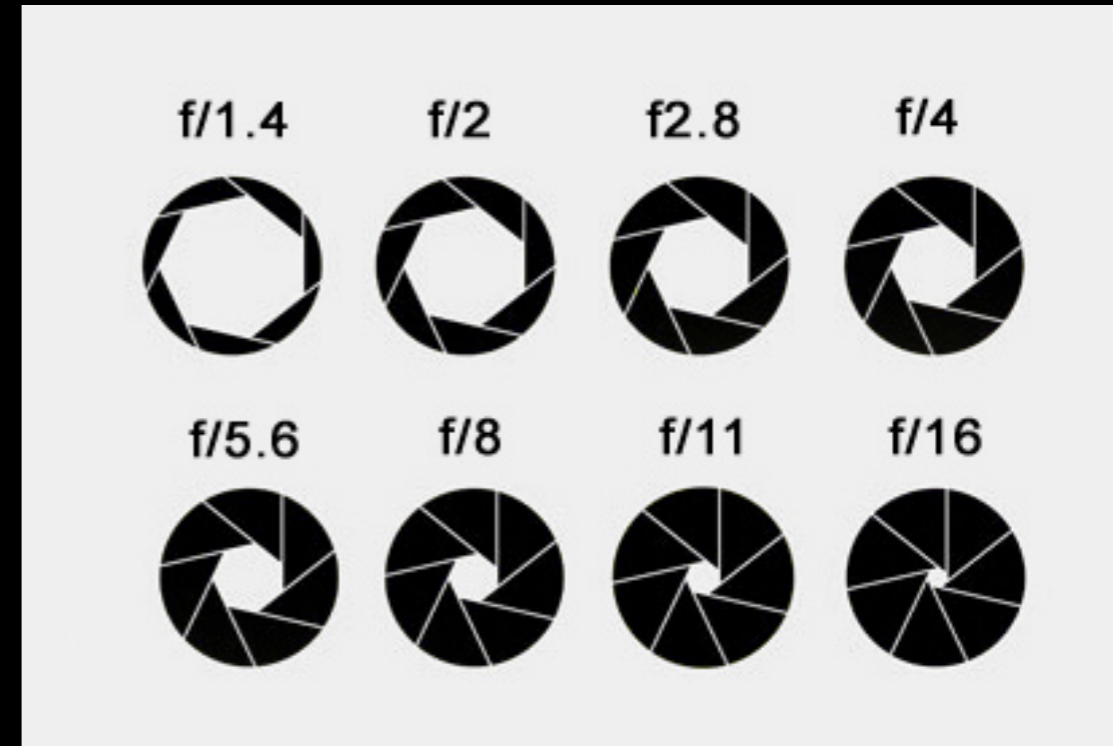


... and  
Shutter  
Speed



# WHAT IS APERTURE?

- (Size of) hole or opening where light enters
- Aperture is normally measured in **f-stop numbers**
- Higher the f-stop, lower the aperture (and vice versa)



# APERTURE FOR EXPOSURE

Low f-stop =  
High aperture =  
Large hole =  
More light =  
Higher Exposure



f/1.8

f/2.8

f/4.0

f/5.6



f/8

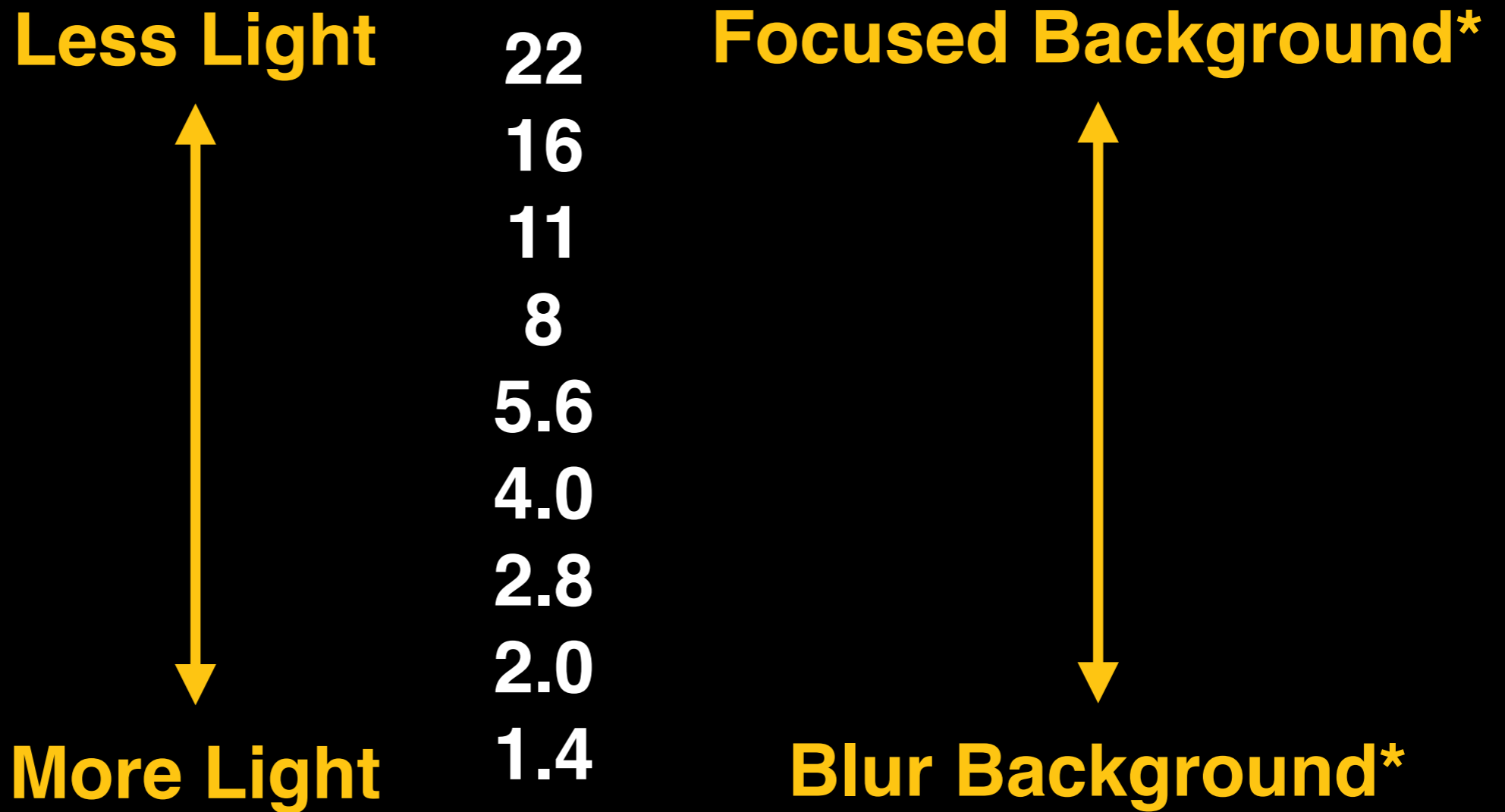
f/11

f/16

f/22

High f-stop =  
Low aperture =  
Small hole =  
Less light =  
Lower Exposure

# APERTURE FOR DOF?



\*We will study the Depth of Field (DOF) in the next session



# APERTURE FOR DOF



22

16

11

8

5.6

4.0

2.8

2.0

1.4

# APERTURE FOR DOF

Gobra

Photography



22

16

11

8

5.6

4.0

2.8

2.0

1.4





# APERTURE FOR DOF



- 22
- 16
- 11
- 8
- 5.6**
- 4.0
- 2.8
- 2.0
- 1.4



# APERTURE FOR DOF



- 22
- 16
- 11
- 8**
- 5.6
- 4.0
- 2.8
- 2.0
- 1.4



# APERTURE FOR DOF



- 22
- 16
- 11**
- 8
- 5.6
- 4.0
- 2.8
- 2.0
- 1.4



# WHAT IS SHUTTER SPEED?

- Length of time the camera's shutter is open
- Longer times lead to more light
- Shorter times lead to less light

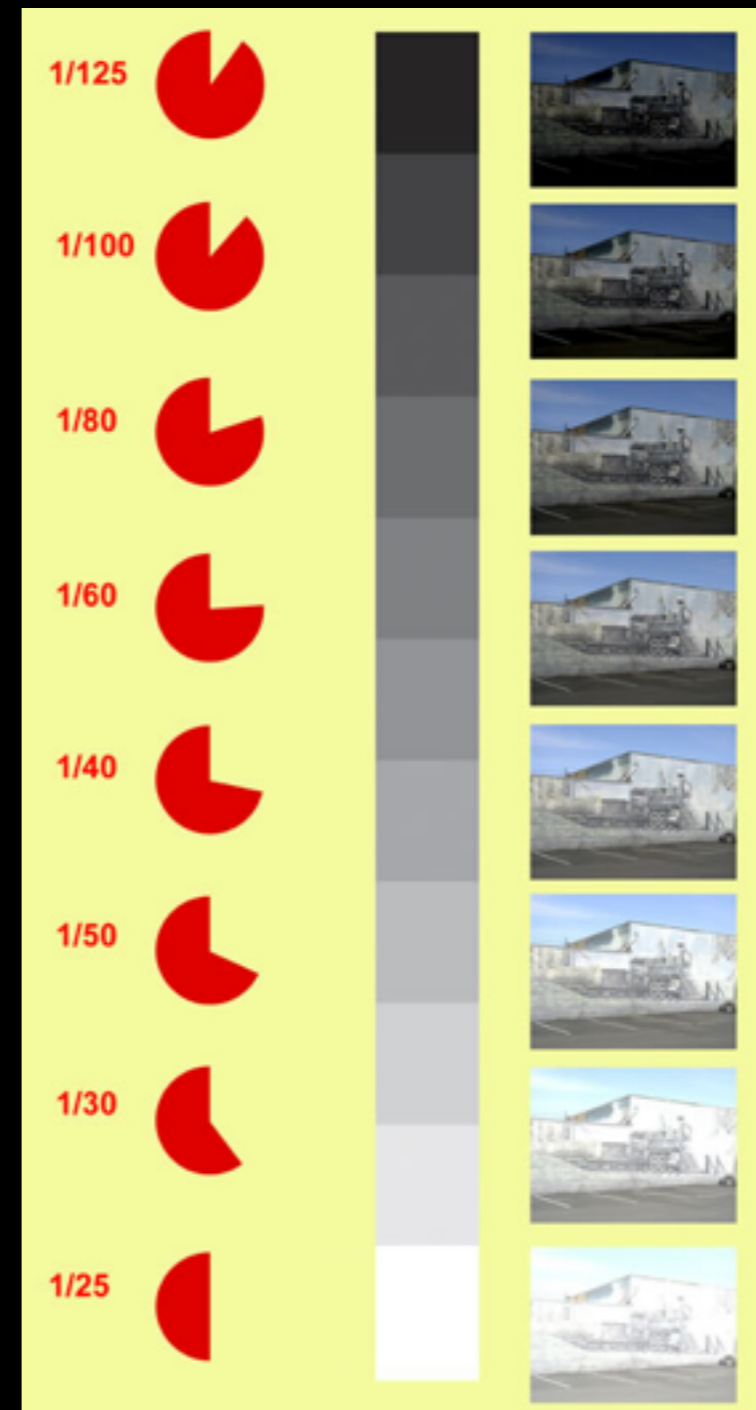


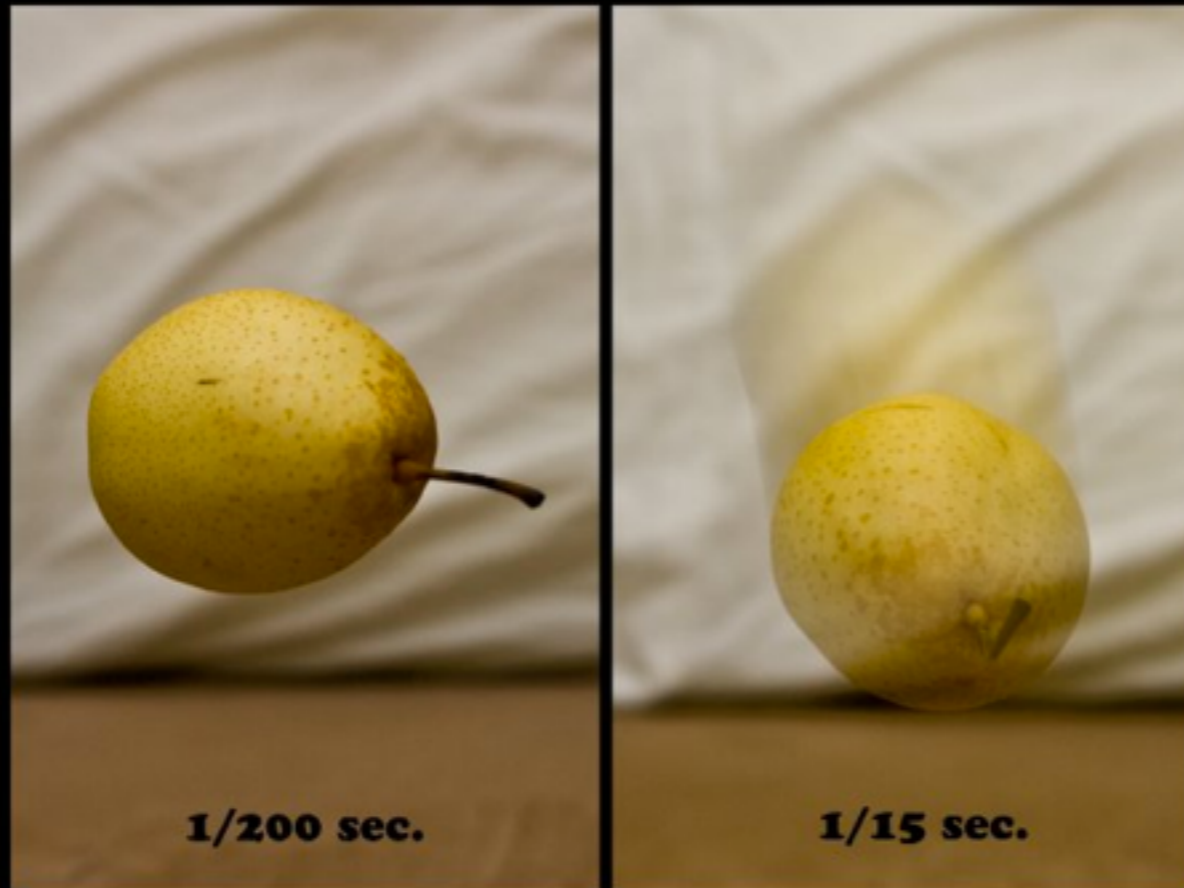
Image Source: [www.shortcourses.com](http://www.shortcourses.com)



# SHUTTER SPEED FOR MOTION

**Faster speed =  
Short Shutter =  
Less Light**

**Motion Freeze**



**Slower speed =  
Long Shutter =  
More Light**

**Motion Blur**

Image Source: [picturethisshuttershooters.files.wordpress.com/](http://picturethisshuttershooters.files.wordpress.com/)

# SHUTTER SPEED FOR MOTION

		8000
		4000
		2000
		1000
		500
		250
One stop		125
		60
		30
		15
		8
1/4 seconds		4
		2
1 second		1"
		2"
4 seconds		4"
		8"
		15"
		30"

Freeze Motion



Motion Blur



# SHUTTER SPEED FOR MOTION

Gobra

Photography



8000

4000

2000

1000

500

250

125

60

30

15

8

4

2

1"

2"

4"

8"

15"

30"



# SHUTTER SPEED FOR MOTION

Gobra

Photography



<https://www.flickr.com/photos/ilouque/6169402770/>

8000  
4000  
2000  
1000  
500  
250  
125  
60  
30  
15  
8  
4  
2  
1"  
2"  
4"  
8"  
15"  
30"





# SHUTTER SPEED FOR MOTION

Gobra

Photography



8000

4000

2000

1000

500

250

125

60

30

15

8

4

2

1"

2"

4"

8"

15"

30"

Gobra

Photography



# SHUTTER SPEED FOR MOTION

Gobra

Photography

8000

4000

2000

1000

500

250

125

60

30

15

8

4

2

1"

2"

4"

8"

15"

30"



[https://www.flickr.com/photos/tyler\\_hayward/6810525681/](https://www.flickr.com/photos/tyler_hayward/6810525681/)



# SHUTTER SPEED FOR MOTION

Gobra

Photography



8000

4000

2000

1000

500

250

125

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1"

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# SHUTTER SPEED FOR MOTION

Gobra

Photography

8000

4000

2000

1000

500

250

125

60

30

15

8

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2

1"

2"

4"

8"

15"

30"



Photo: Owais ur Rehman Shah



# SHUTTER SPEED FOR MOTION

Gobra

Photography

8000

4000

2000

1000

500

250

125

60

30

15

8

4

2

1"

2"

4"

8"

15"

30"



<https://www.flickr.com/photos/dstylezs/4425413727/>



# WHAT IS ISO?

Measure of the sensitivity of digital imaging systems

	32
	50
	100
	200
	400
	800
	1,600
	3,200
	6,400
	12,800
One stop	25,600
	51,200
	102,400

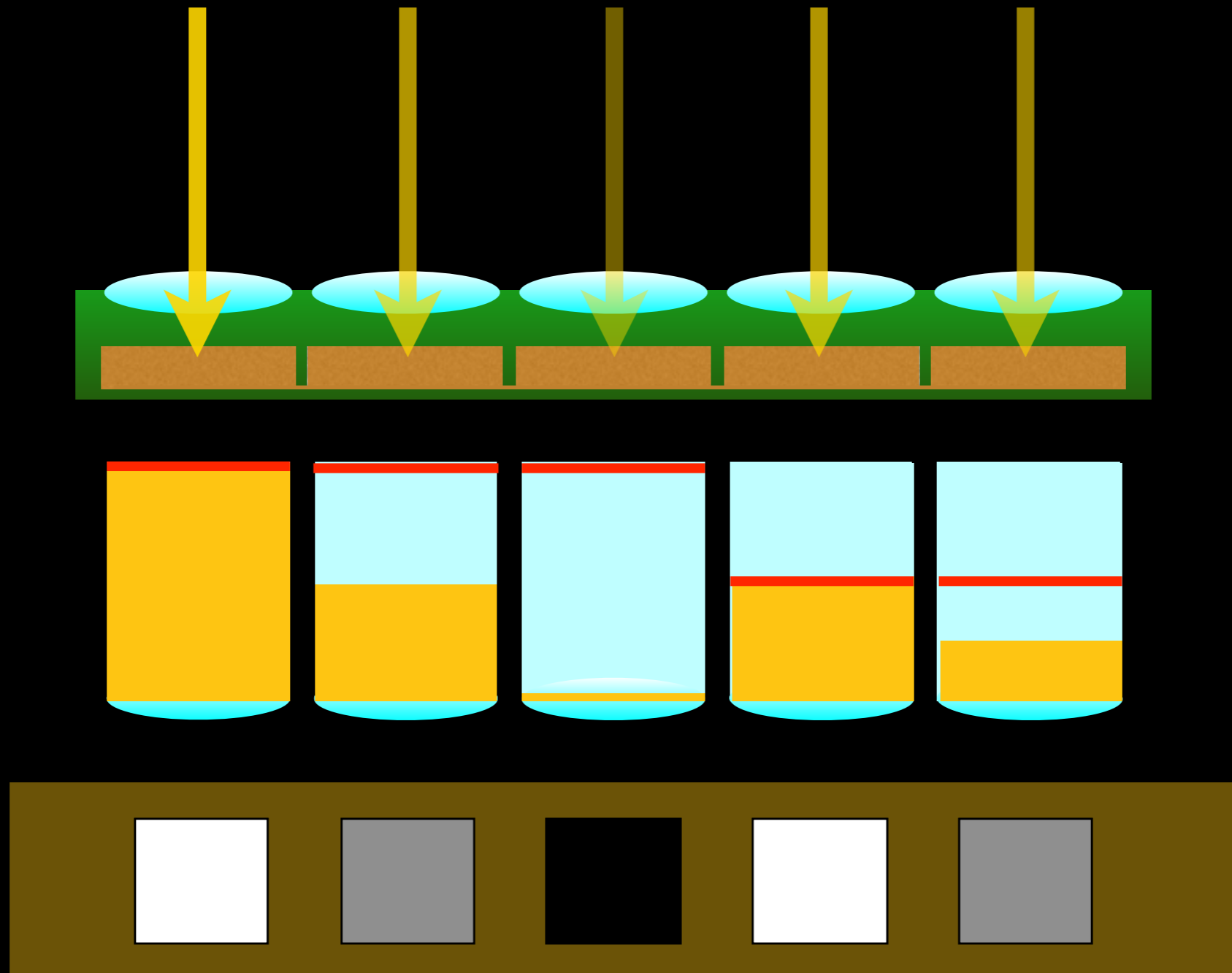
Optimal Image Quality



High Sensitivity



# WHAT IS ISO?



# ISO FOR LOW LIGHT

Gobra

Photography



32

50

100

200

400

800

1,600

3,200

6,400

12,800

25,600

51,200

Gobra

Photography





# ISO FOR LOW LIGHT

Gobra

Photography



32

50

100

200

400

800

1,600

3,200

6,400

12,800

25,600

51,200

Gobra

Photography



# ISO FOR LOW LIGHT

Gobra

Photography



32

50

100

200

400

800

1,600

3,200

6,400

12,800

25,600

51,200



# BASICS OF DIGITAL PHOTOGRAPHY

**Try different apertures,  
shutter speeds & ISO  
values till next session**

# BASICS OF DIGITAL PHOTOGRAPHY

**Thanks ;)**