


PHY385-H1F Introductory Optics

Class 13 – Finishing Chapter 5

- Magnifying Glass
- Newtonian Form of Thin Lens Equation
- Microscope
- Telescopes



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HandHeld Magnifiers

M-3 3" Round Standard Handheld Magnifier
3" Round Standard Magnifier with 5-power bifocal insert. Excellent value for basic inspection use.

Made In The USA

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POWER: 3x with 5x Bifocal Insert
PACKING: Blister Carded
ORDER NOW Price: \$9.99 \$7.99

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Made In The USA

POWER: 3x with 5x Bifocal Insert
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PACKING: Blister Carded or Boxed
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What is the focal length of a magnifier which has "POWER 3x"?

1. 3cm
2. 8 cm
3. 16 cm
4. 25 cm

Crossing the street

- You are crossing the street, and you look to your left. You either see Car A or Car B. What do you think is the difference?



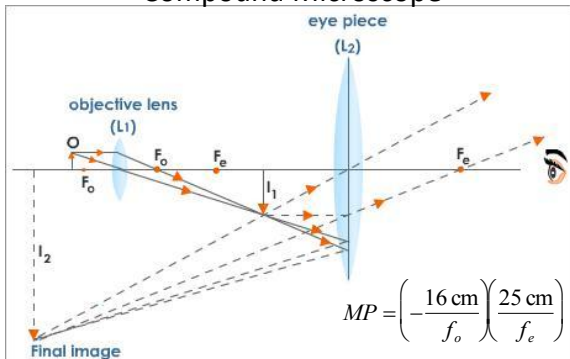
1. Car B is bigger
2. Car B is closer
3. It is impossible to tell without further information

Compound Microscope

- Invented by Zacharias Jansen of Holland (1590)
- Objective lens at the bottom forms a real, inverted image in the tube.
- Eyepiece at the top is used as a magnifier to view this image.



Compound Microscope



Compound Microscope Example

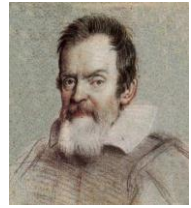
- A microscope has an eyepiece with focal length $f_e = 3.0 \text{ cm}$, and an objective lens with focal length $f_o = 2.0 \text{ cm}$
 - A bacterium is viewed with the microscope.
 - Assuming this is a standard tube length microscope, what is the image distance s_i of the real image of the bacterium formed by the objective lens?
1. 2.0 cm
 2. 3.0 cm
 3. 14 cm
 4. 16 cm
 5. 18 cm

Compound Microscope Example

- A microscope has an eyepiece with focal length $f_e = 3.0$ cm, and an objective lens with focal length $f_o = 2.0$ cm
 - A bacterium is viewed with the microscope.
1. How far from the objective should the bacterium be placed?
 2. What is the magnification?

Telescope

- Invented by somebody in Holland in 1608
- Galileo of Italy used one in 1610
- Kepler of Germany published a working design in 1611
- Objective forms a real, inverted image in the tube.
- Eyepiece is used as a magnifier to view this image.



Galileo Galilei



$$MP = \frac{\alpha_a}{\alpha_u}$$

Galileo's discoveries with his telescope

Craters on the moon.



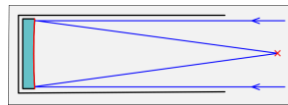
Jupiter has moons that orbit around it.



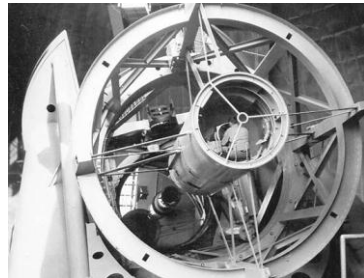
Venus goes through phases as it orbits the Sun.



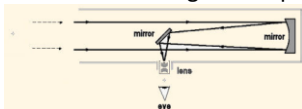
Reflecting Telescope arrangements



- Prime focus



Reflecting Telescope arrangements

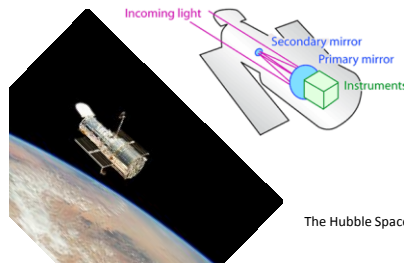
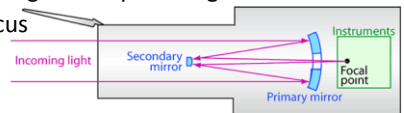


- Newtonian focus



Reflecting Telescope arrangements

- Cassegrain focus



The Hubble Space Telescope