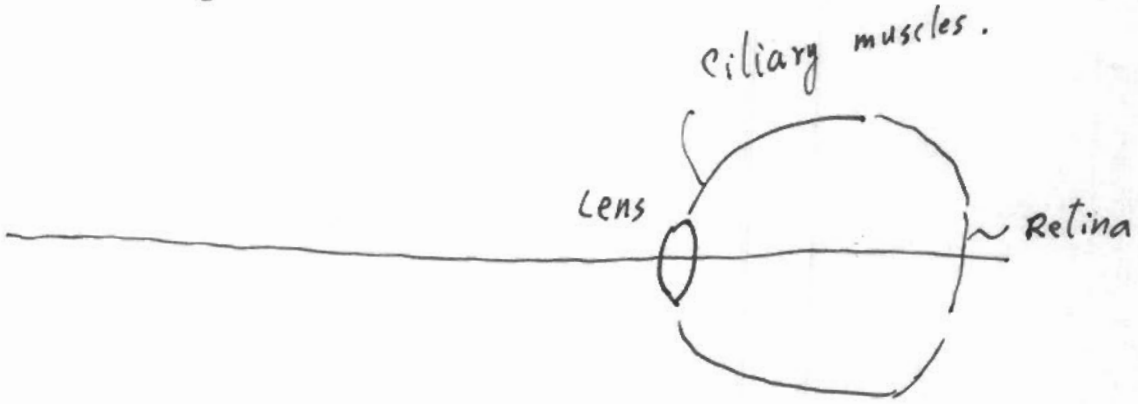
Lecture 34.

Wed. Dec. 1, 2004.

• The Human Eye.



For distant objects — (flat lens, long f.) — muscles relaxed

For near objects — (curved lens, short f) — muscles tensed.

• near point. — shortest distance one can ~~focus~~ focus on.

$$np \approx 25 \text{ cm}.$$

• far point. — longest distance.

$$fp \approx \infty.$$

• Nearsightedness:

fp = finite. (can't focus when an object is far away)

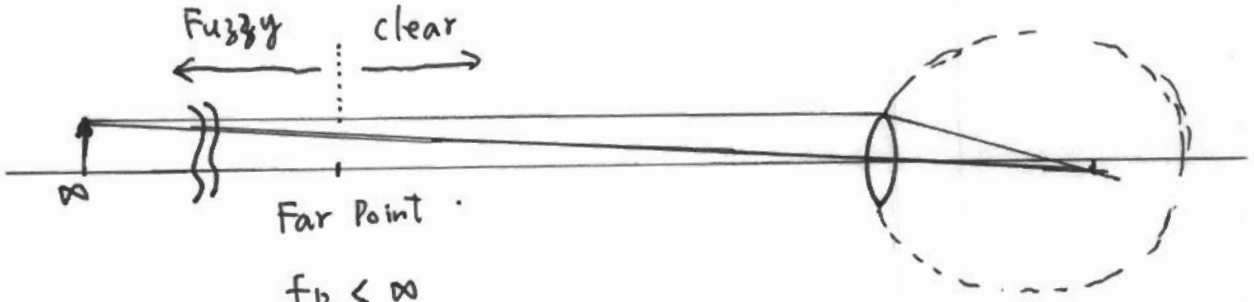
• Farsightedness:

$np > 25$ cm. (can't read well when the book is closer than np)

Physics 102.

Lecture 35.

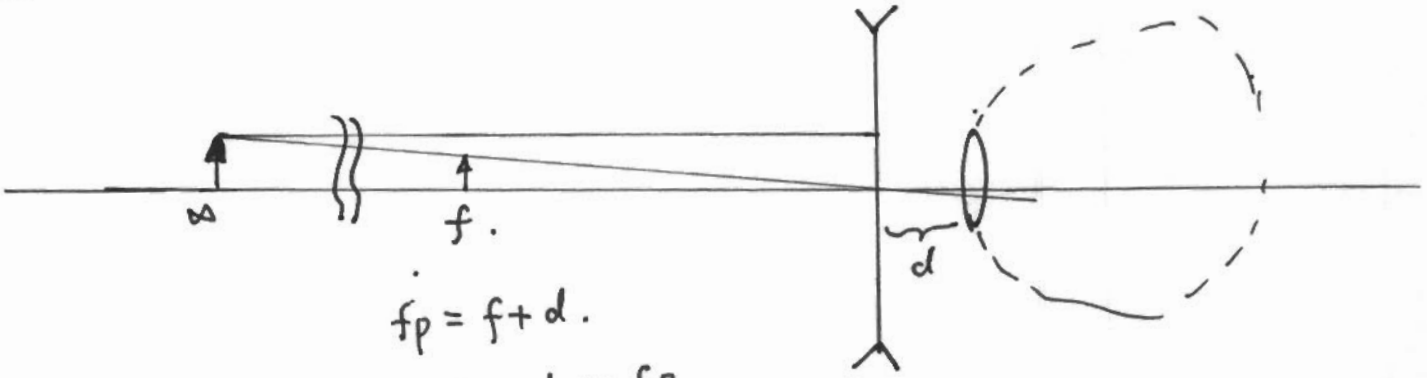
- Nearsightedness. — Can't see objects far away clearly ∵ $f_p < \infty$ myopic



$f_p < \infty$

Solution: "bring" the object to the f_p.

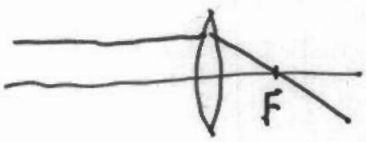
by a diverging lens.



$f_p = f + d$.

$f = f_p - d \approx f_p$.

- Refractive power R.P.



$$\text{Refractive power} = \frac{1}{f}$$

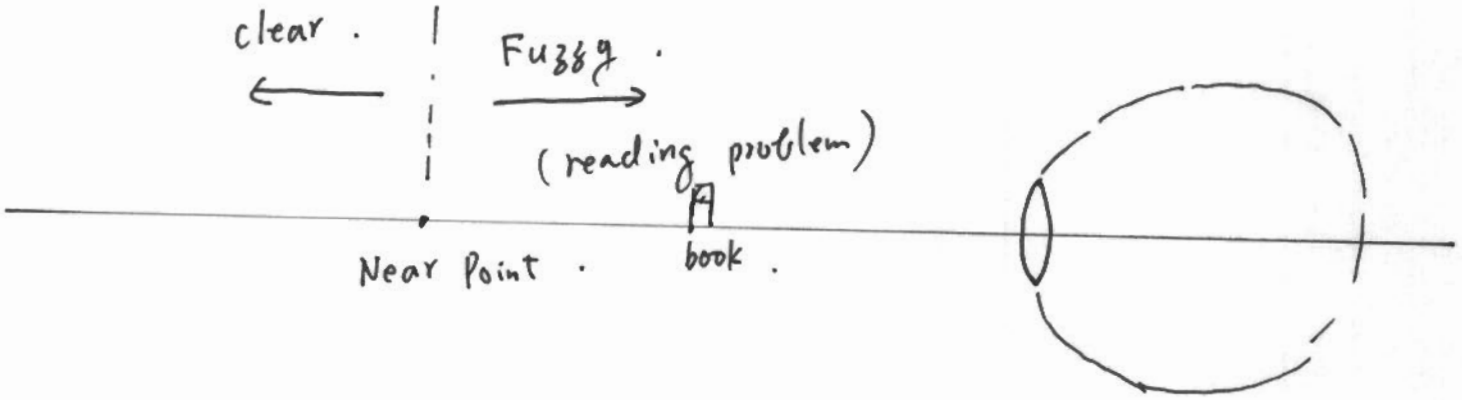
unit: (diopter) $= m^{-1}$.

~~light is bent~~.

The larger the $|R.P.|$, the more the bending effect of the lens.

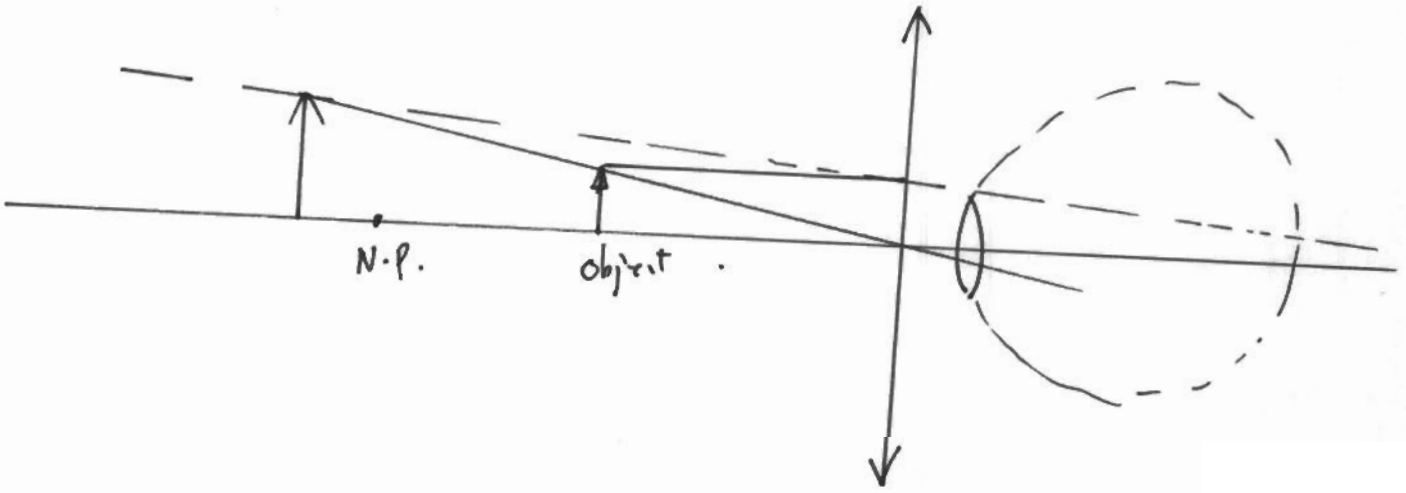
- Farsightedness — $np > 25$ cm. (hyperopic)

Can't see objects closer than np.



Solution: "push" the book farther away.

by a converging lens.



---

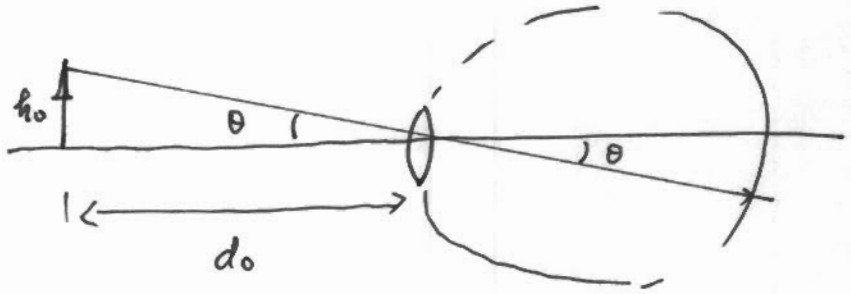
e.g. p.894. e.g. 27-2.

e.g. p.897. e.g. 27-3.

- The magnifying glass

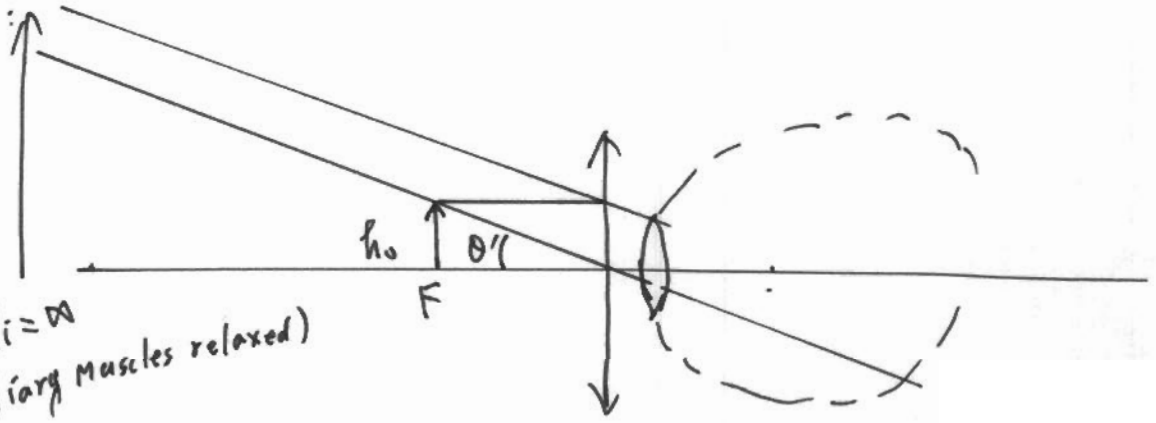
Problem : Hard to see a small object.

small θ. $\quad \theta \approx \tan\theta = \frac{h_o}{d_o} = \frac{h_o}{N}$ $\quad N = np. \approx 25\ cm$



Solution : increase θ.

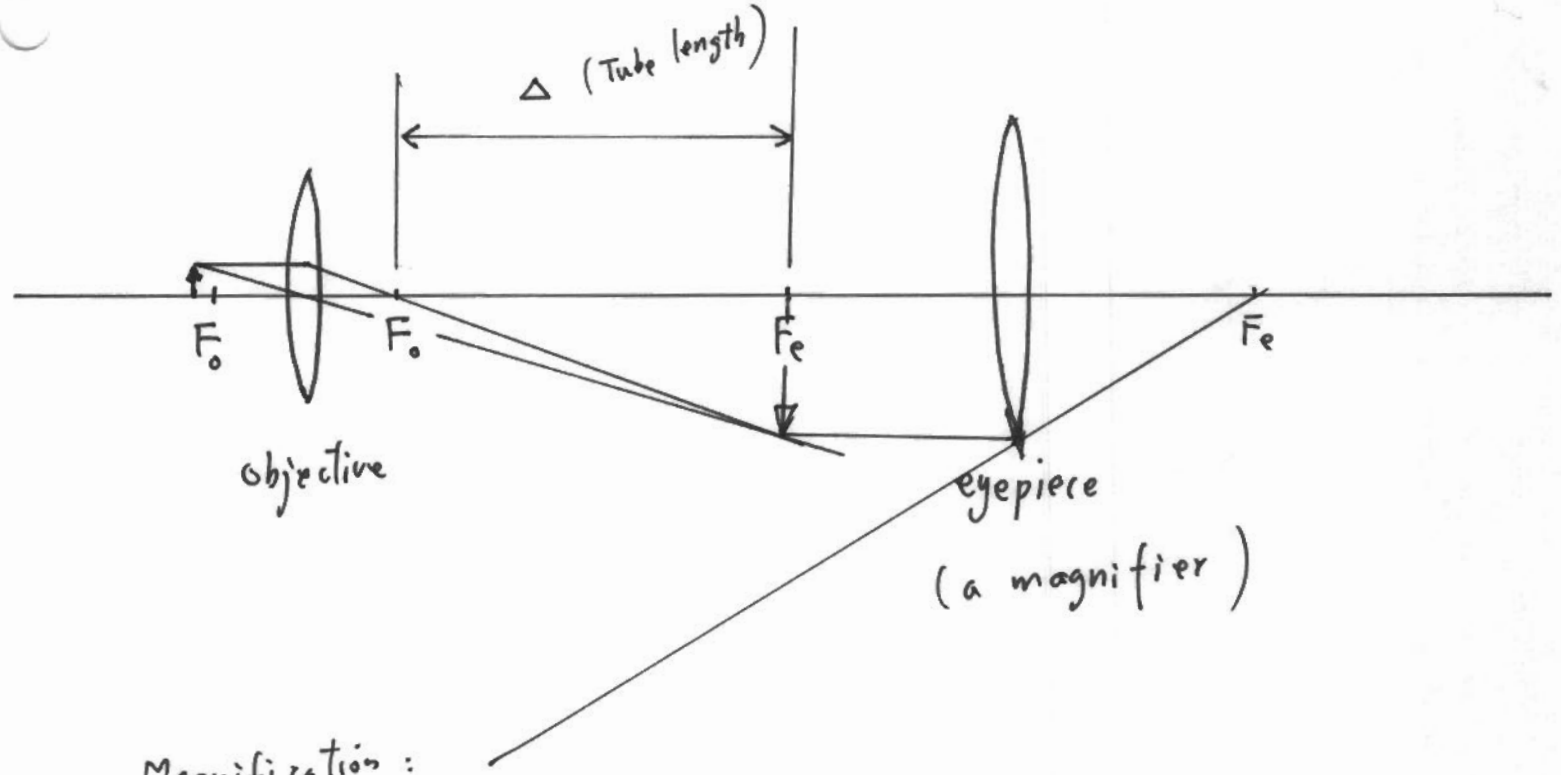
Typically, use a convex lens.
put the object at the focal point.



$$\theta' = \frac{h_o}{f}$$

Angular magnification: $M = \frac{\theta'}{\theta} = \frac{N}{f}$.

- The Compound Microscope.



Magnification:

$$m_o \approx \frac{f_o}{\Delta + f_o} = -\frac{\Delta + f_o}{f_o + \delta} \approx -\frac{\Delta}{f_o}$$

$$m_e \approx \frac{N}{f_e}.$$

$$M_{Total} = m_o \cdot m_e \approx -\frac{\Delta \cdot N}{f_o f_e}.$$