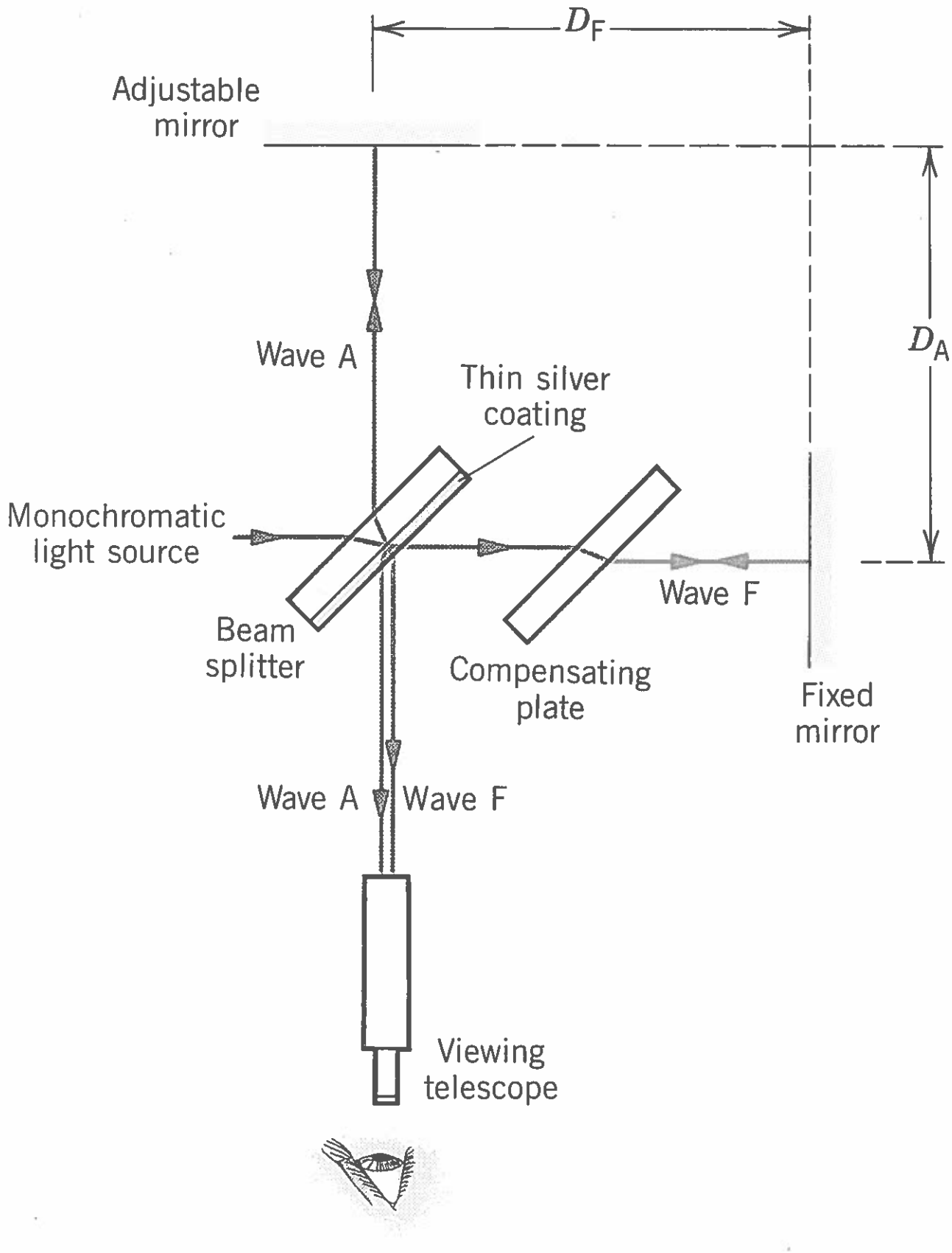
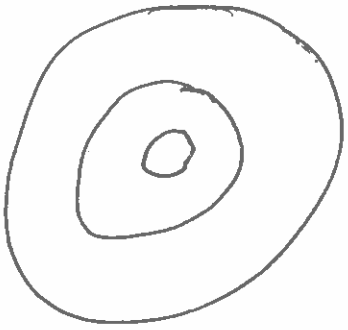


FIGURE 27.15

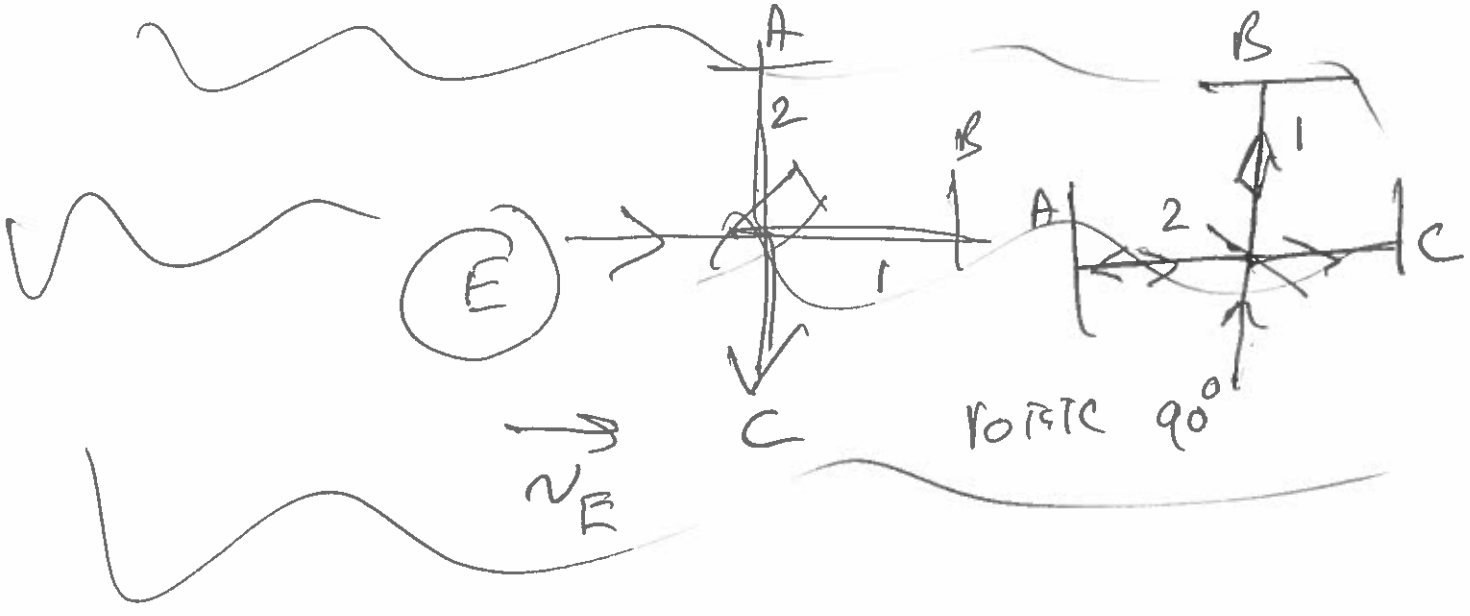
Path diff = $m\lambda$ Constructive Interference



1887 - Michaelson - Morley experiment
of what is now Case-Western University in Cleveland.

Measure Earth's speed in <u>Aether</u>.

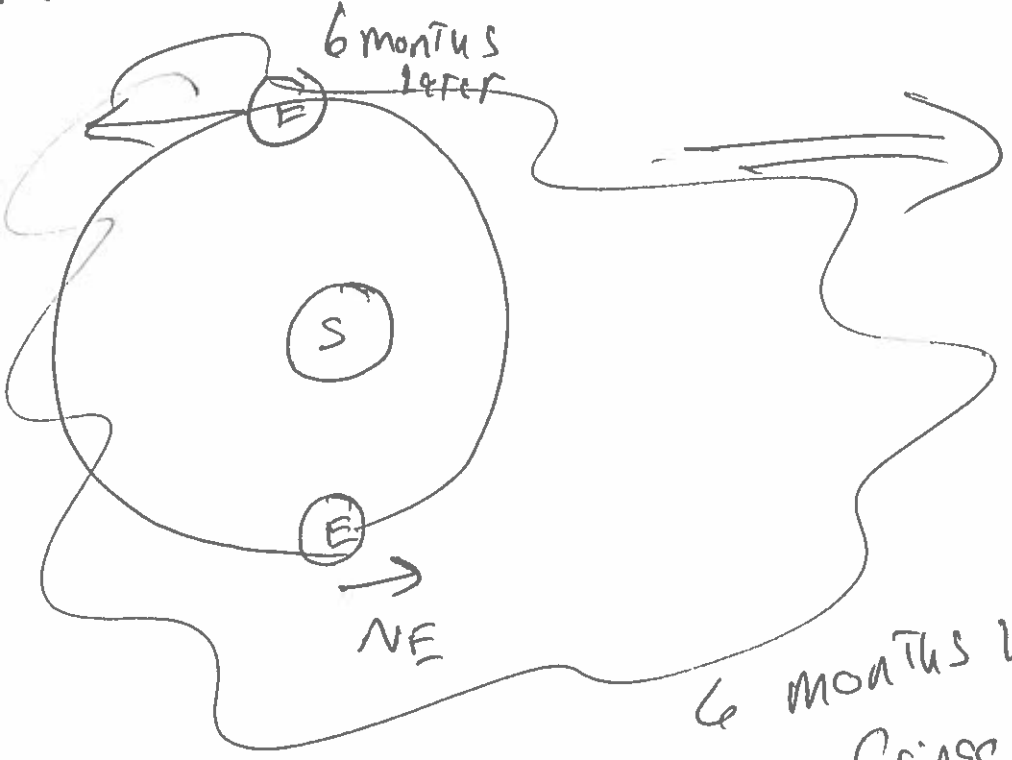
Aether is the odorless, colorless, massless medium required for light to propagate.



Rotation of Interferometer
Should cause fringes to move
The number of fringes moved
is proportional to speed of
Earth relative to Aether.
No fringe shift!

No fringe shift implies Earth
not moving relative to Aether.

Assume Aether Goes ⟹ Right

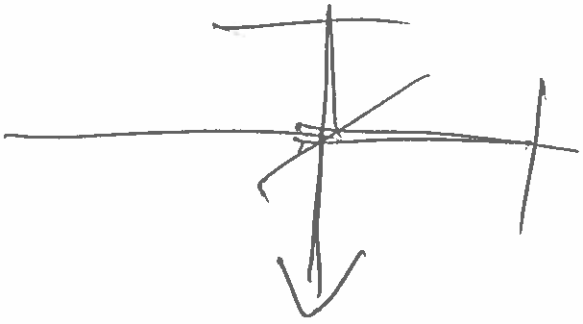


No fringe shifts $\Rightarrow$ No Aether

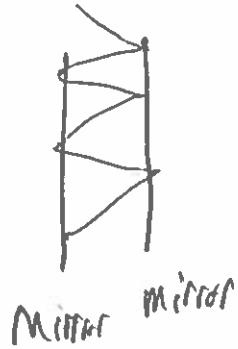
No medium required for light waves!

Also leads to relativity theory

Interferometers Are used for lots of precision small measurements

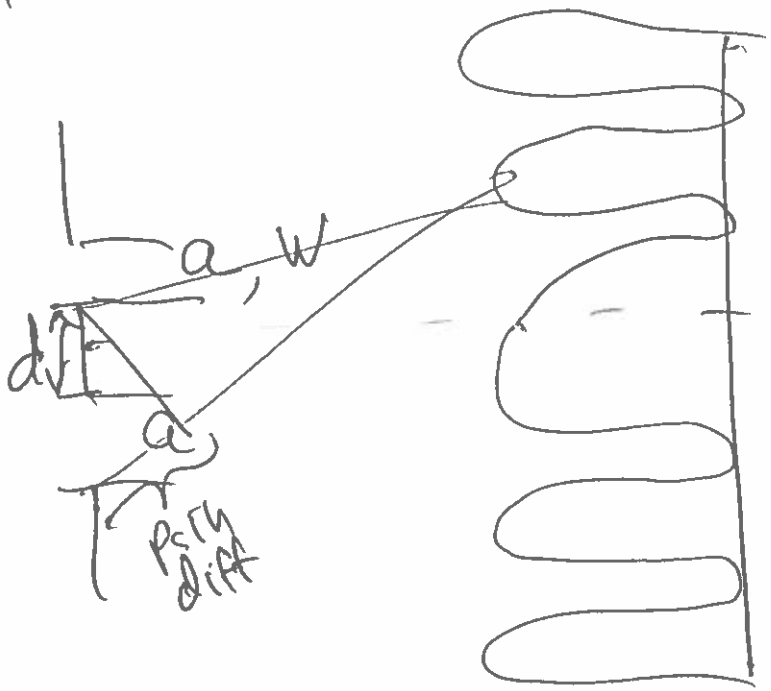


Michaelson – Morley



Fabri – Perot Interferometer

Interference is the adding/subtracting of waves due to phase differences



a, w are width of slit

d is space between slits

Light fringes

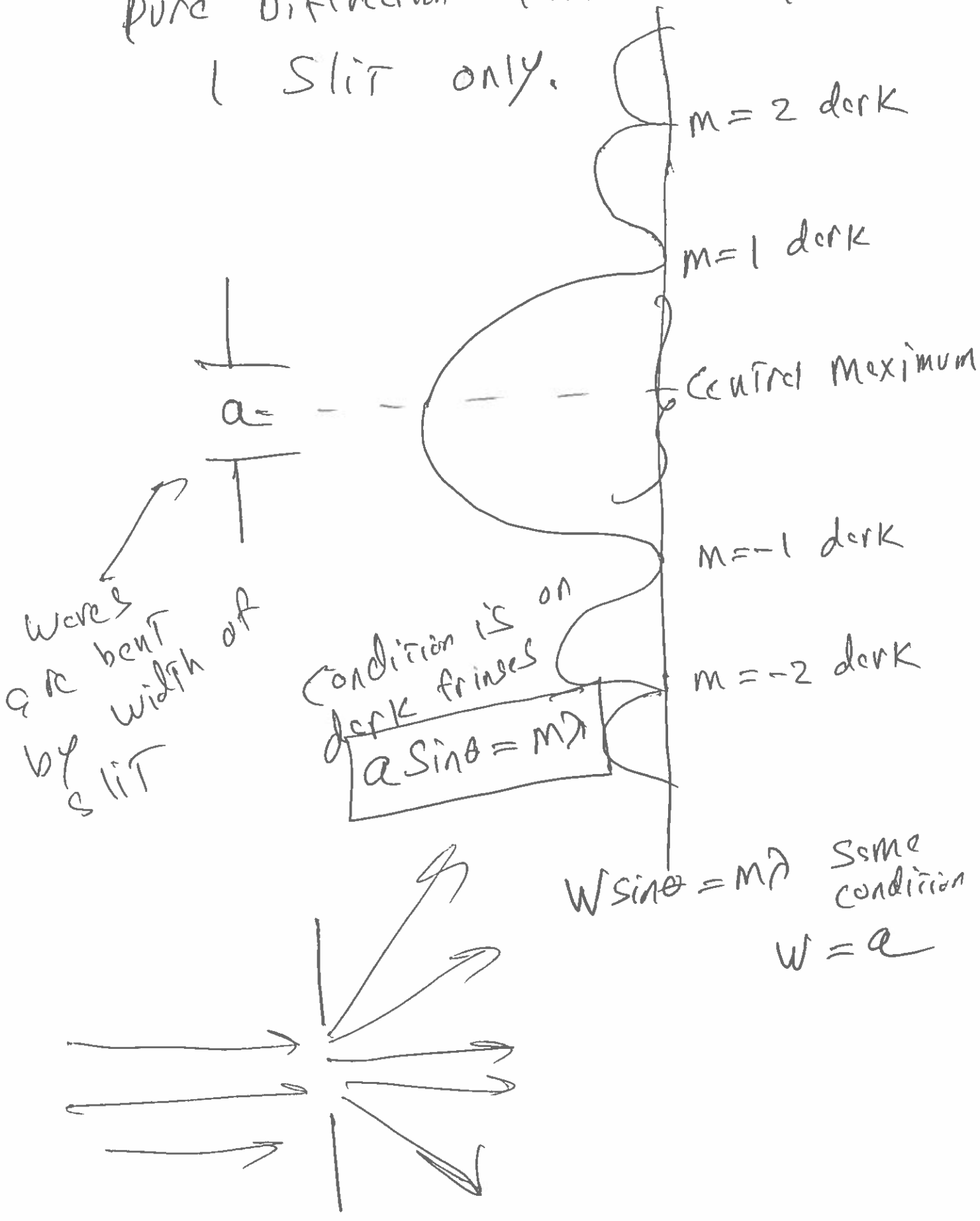
Dark fringes

In a lab you Actually get

Diffraction is the bending of light due to barriers interacting

Diffraction results from the width of slits!

Pure Diffraction happens when you have 1 slit only.



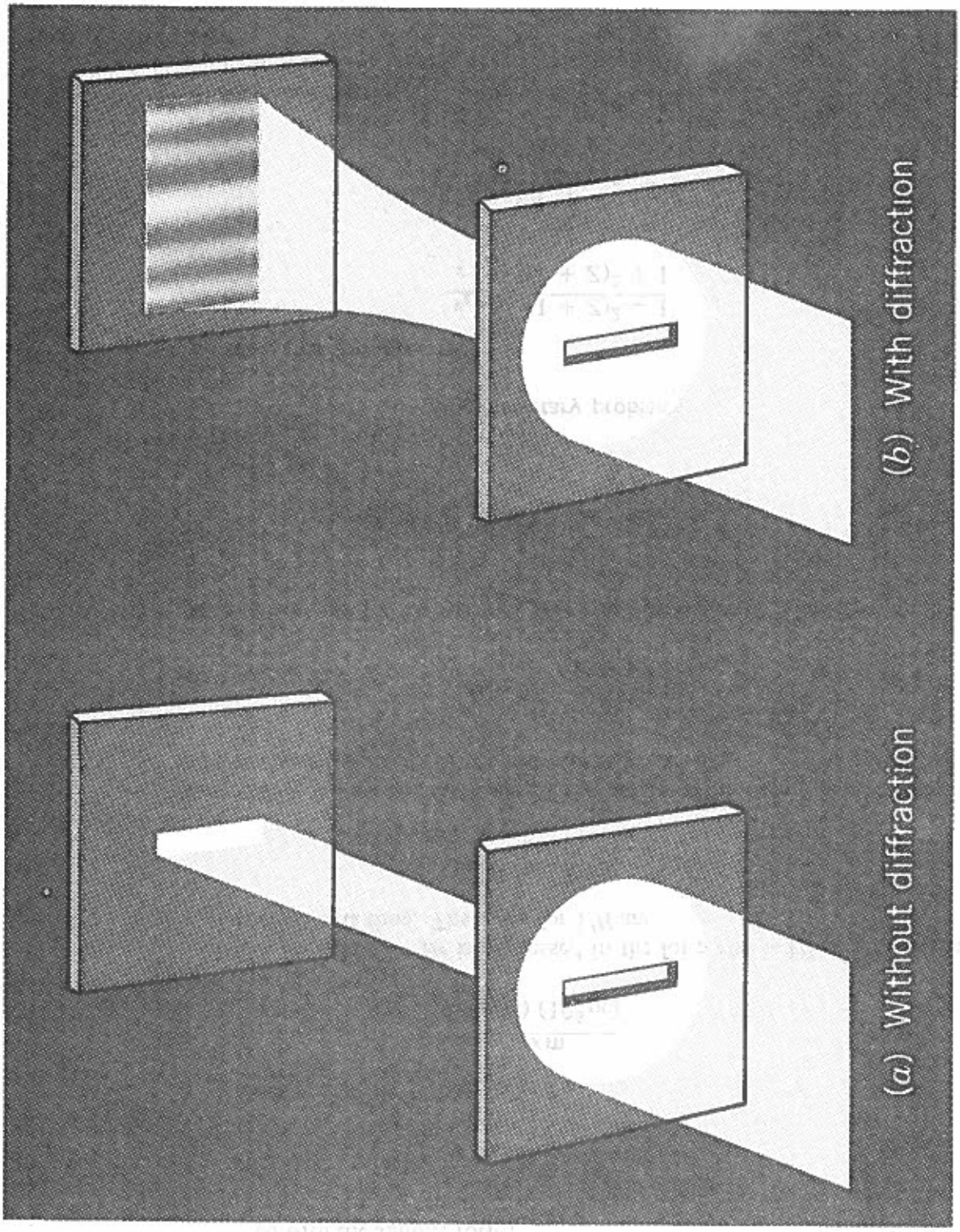
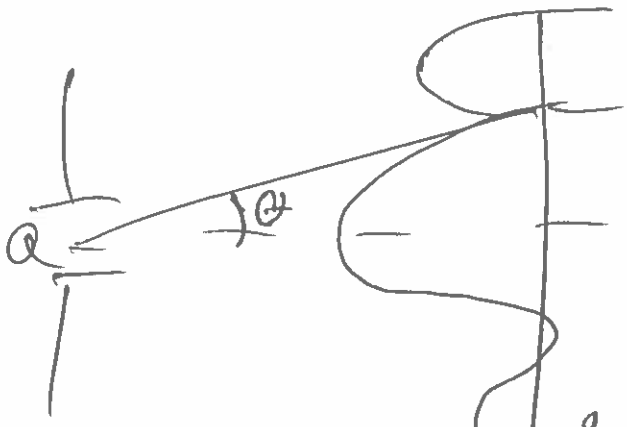


FIGURE 27.18 a, b 210

As with interference, diffraction is noticeable only when $\lambda \sim a$

$$\lambda = \frac{v}{f} = \frac{340\ m/s}{170\ 1/s} = \underline{2\ m}$$

eg/ 500nm light $a = 1 \times 10^{-6}\ m$ at what angle is first dark



$$a \sin\theta = m\lambda$$

$$\sin\theta = \frac{m\lambda}{a}$$

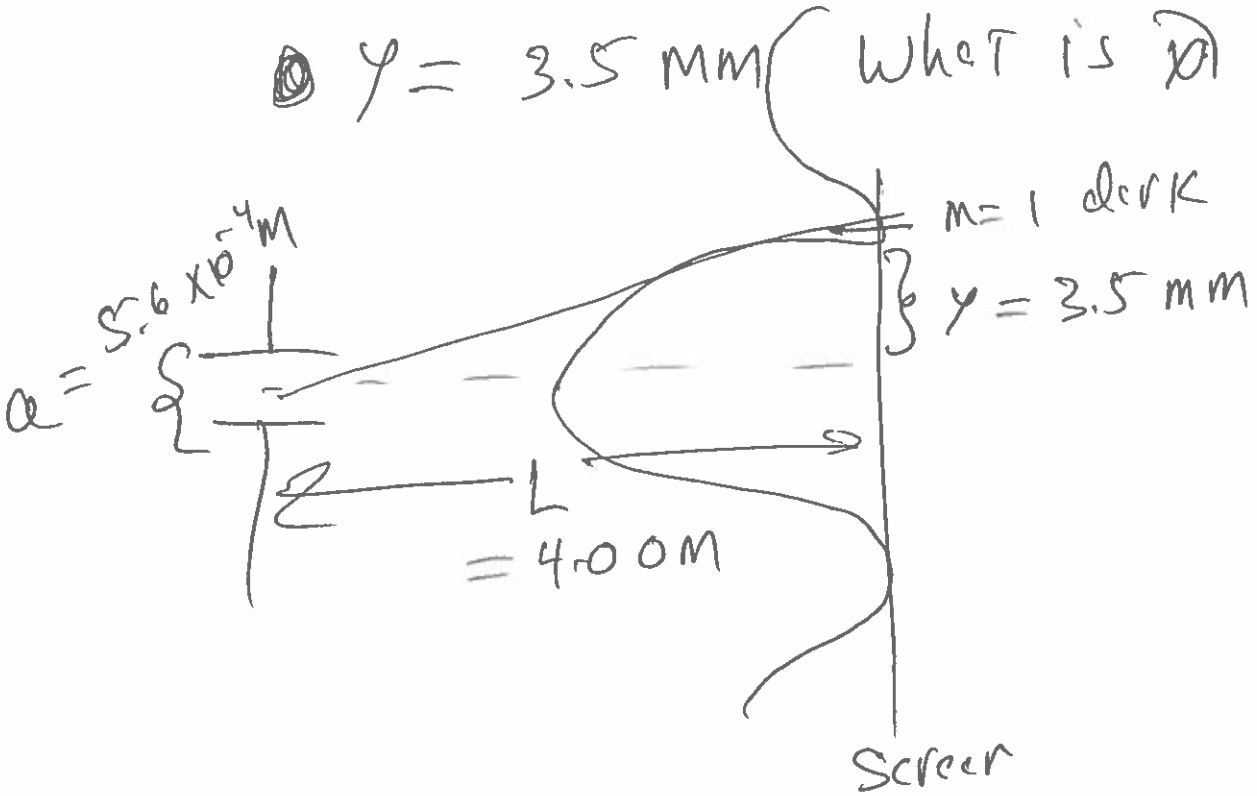
$$\sin\theta = \frac{(1)(500 \times 10^{-9}\ m)}{1 \times 10^{-6}\ m} = 0.5$$

$$\theta = \sin^{-1}(0.5) = 30^\circ$$

27-25

$w = 5.6 \times 10^{-4}\ m \qquad L = 4.0\ m$

(a) $y = 3.5\ mm$ (what is λ)



dark condition is

$$a \sin\theta = m\lambda$$

$$\lambda = \frac{a}{m}\sin\theta = \frac{5.6\times10^{-4}\ m}{1}\sin\theta$$

$$\tan\theta = \frac{y}{L} = \frac{3.5\times10^{-3}\ m}{4\ m} \Rightarrow \theta = 5.0\times10^{-2}{}^{\circ}$$

$$\theta = 0.05^{\circ}$$

$$\lambda = 5.6\times10^{-4} m \sin(0.05^{\circ})$$

$$\lambda = 4.90\times10^{-7}\ m = \boxed{490\ nm}$$

27-31 How many dark fringes on either side of central max if

$\lambda = 651\ nm \quad a = 5.47 \times 10^{-6}\ m$

$a \sin\theta = m\lambda$ dark

$m = \frac{a \sin\theta}{\lambda}$ for maximum $\theta = 90^\circ$

$m = \frac{a \sin(90)}{\lambda} = \frac{a}{\lambda} = \frac{5.47 \times 10^{-6}\ m}{651 \times 10^{-9}\ m}$

$m = 8.4 \Rightarrow \boxed{m = 8}$

8 dark fringes on either side.