* When a wavefront of light is obstructed by an obstacle, each point becomes a secondary wavelet. All such secondary wavelets spread light waves in all directions. When diffracted waves interfere a pattern of maxima & minima is generated.

* $$I_\theta = I_m \left(\frac{\sin \alpha}{\alpha} \right)^2$$

$$\alpha = \frac{\pi a}{\lambda} \sin\theta$$

* Diffraction result in to widening of images.

* Diffraction effects becomes weak as the obstacle become bigger than the wavelength of wave being diffracted.

* The angle of diffraction changes with the wavelength.

* Single slit can separate the colors of light but the spectral lines are

too broad to be resolvable.

* Dispersive power is too small for it to be pratically useful.

* the intensity of those spectra are too weak for a single slit.

* Intensity :

$$I_0 = I_m \left(\frac{\sin\alpha}{\alpha}\right)^2 \left(\frac{\sin N\beta}{\beta}\right)^2$$

$$\alpha = \pi \frac{a}{\lambda} \sin\theta \qquad \beta = \pi \frac{d}{\lambda} \sin\theta$$

grating element : $d = a + b$

maxima $\Rightarrow$ $I_0 = N^2 I_m \left(\frac{\sin\alpha}{\alpha}\right)^2$

$$\beta = m\pi$$

$$d\sin\theta = m\lambda$$

minima $\Rightarrow$ $I_\theta = 0$ $\quad N\beta = m'\pi$

$$d\sin\theta = \frac{m}{N}\lambda \quad (m' \neq mN)$$

* Gratings produce well defined, well resolved & well dispersed spectra
  ↳ spectroscopy.

* Fraunhofer was the first make a diffraction grating.

* The modern grating ruling machines were first made by Rowland.

* Dispersive power of a grating

$$= \frac{d\theta}{d\lambda} = \frac{m}{d\cos\theta} \approx mN'$$

* $$R.P = mN = \frac{d}{1.22\lambda} = \frac{1}{\theta_R}$$