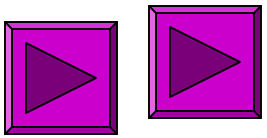
Announcements

1. Reworked exam 2 due today
2. Special announcements 
3. Today's topics – Chapter 34 & 35

   reflection and refraction continued

   frequency (wavelength) dependent effects -- prisms & rainbows

Wake Forest University Research Fellowship Program

This program is designed to encourage undergraduate students to join their professors as junior partners in scholarly research projects of mutual interest either during the academic year or during the summer.

Talk to your professors and/or check the webpages:
http://www.wfu.edu/undergraduate_college/research-fellowship

http://www.wfu.edu/undergraduate_college/research-fellowship/ideas.html#P

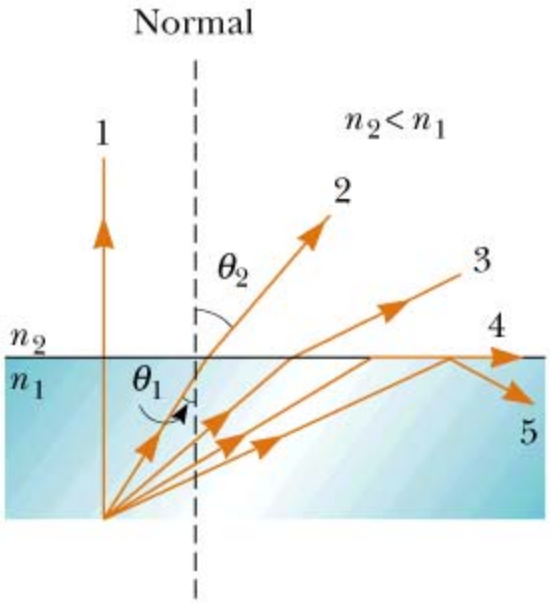
Physics T-Shirt Design Contest

All entries will be appreciated by a panel of *distinguished* SPS students by **April 21th, 2003**. Please place your entry in the box in the Physics Office attached to the entry form.

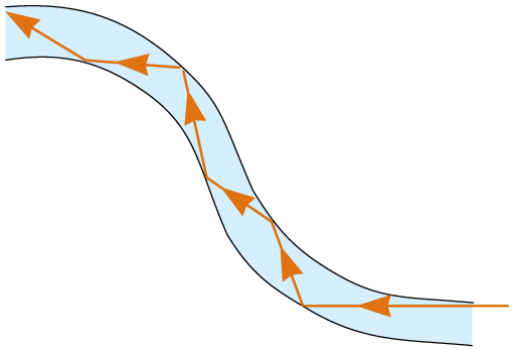
Refraction of light – Snell's law: $n_1 \sin\theta_1 = n_2 \sin\theta_2$

If $n_2 < n_1$ "total internal reflection" is possible for

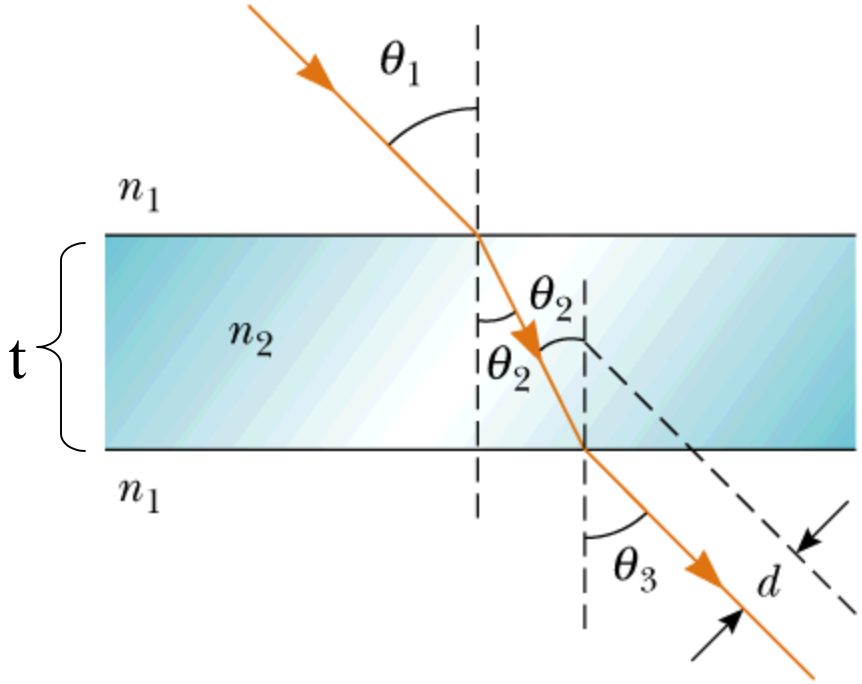
$$\theta_1 \geq \sin^{-1}\left(\frac{n_2}{n_1}\right)$$



Light traveling in an optical fiber :



Refraction of light passing through a material of thickness "t"

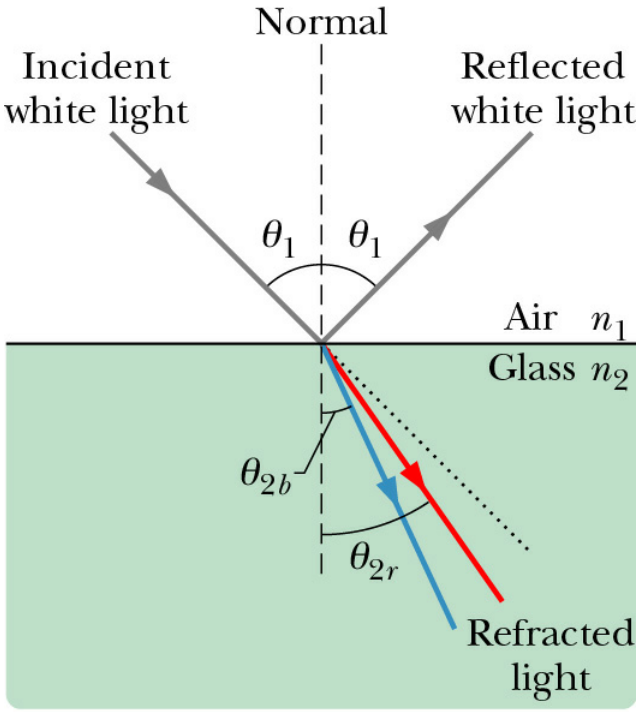


Use geometrical optics to determine the beam separation "d" in terms of n_1, n_2, t, and θ.

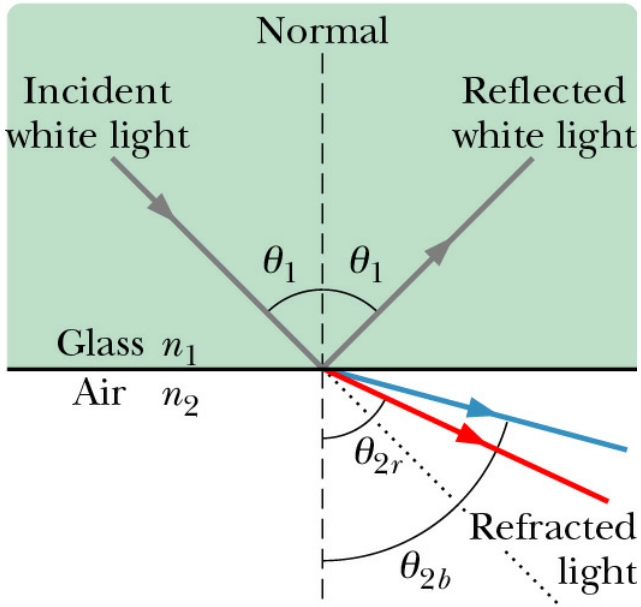
$$n_1 \sin\theta_1 = n_2 \sin\theta_2$$

$$d = t \sin\theta_1 \left(1 - \frac{n_1}{n_2} \frac{\cos\theta_1}{\cos\theta_2} \right)$$

Effects of frequency (wavelength) dependence of refractive index – $n_2(\omega)=n_2(\lambda)$.

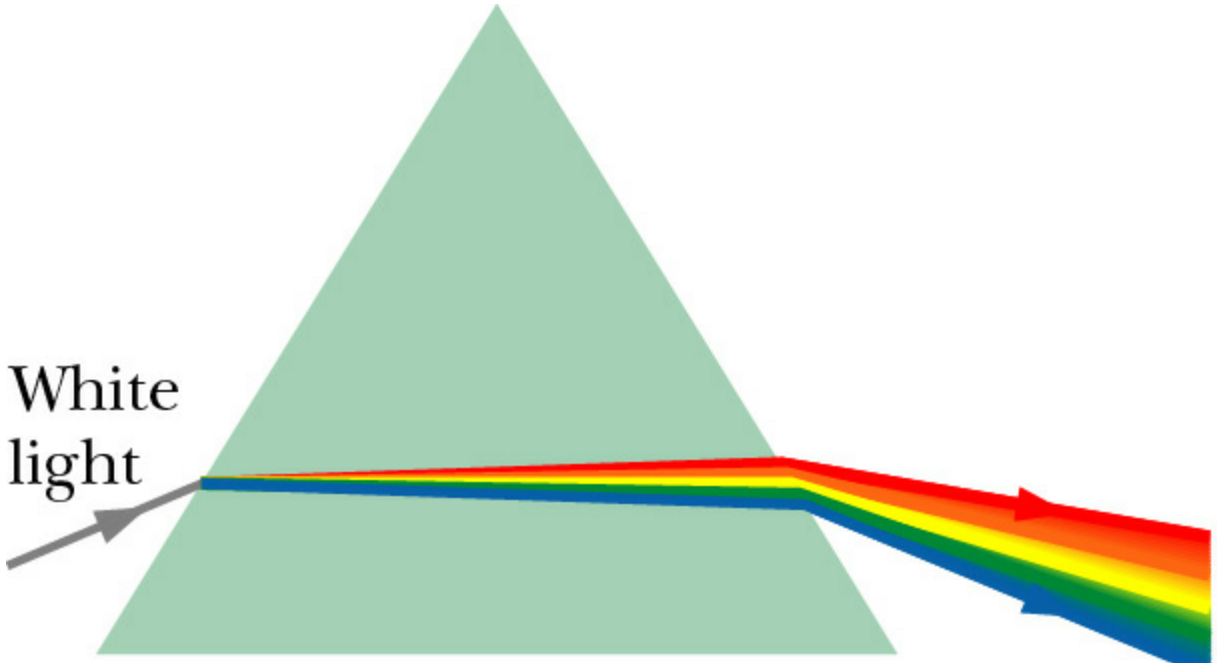


(a)



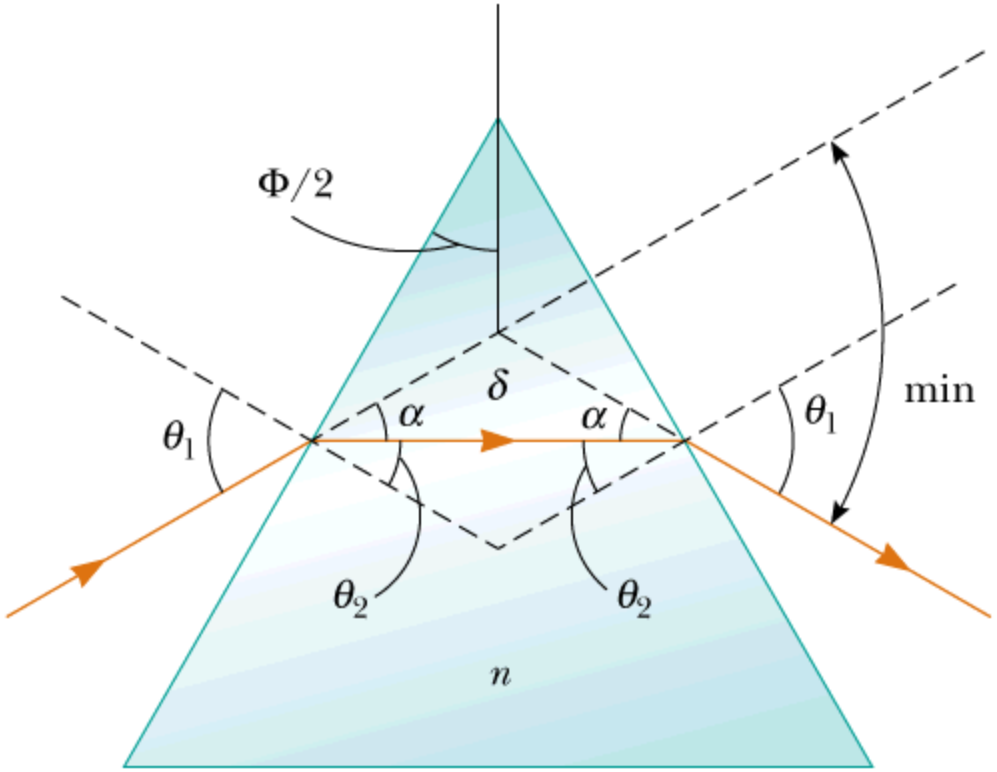
(b)

Prism geometry – enhances the frequency (wavelength) dispersion



(*b*)

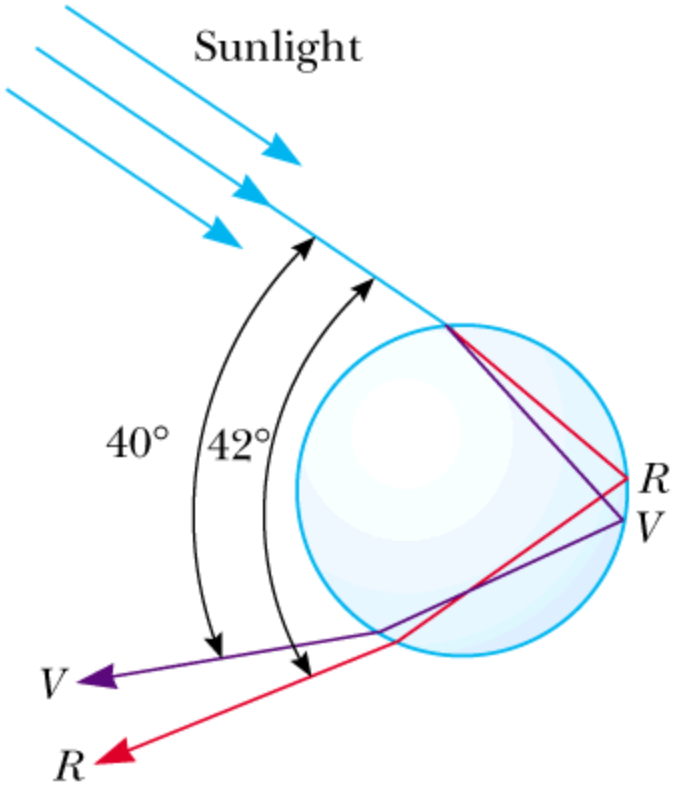
Set up for measuring refractive index *n* using a prism

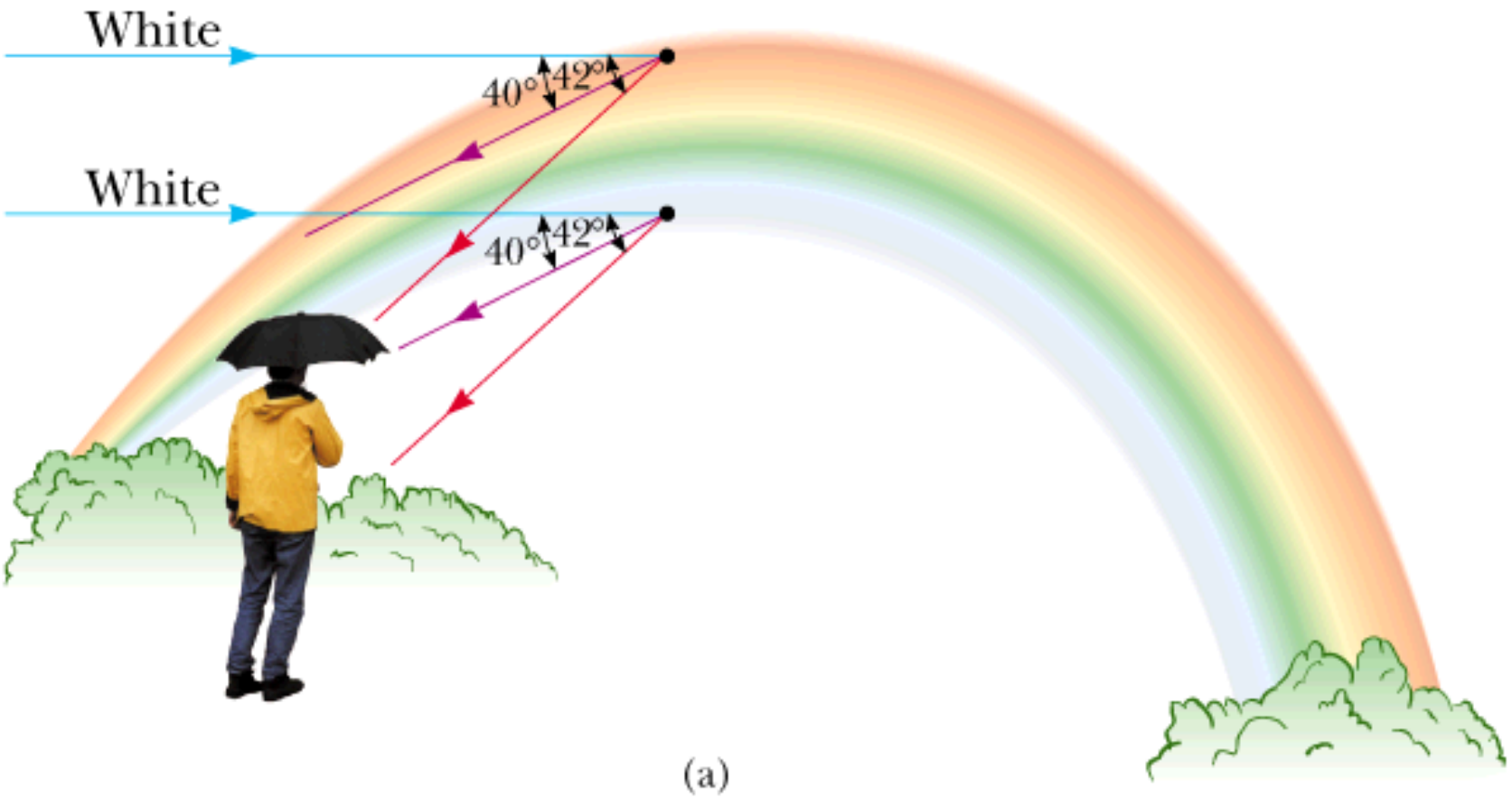


$$n = \frac{\sin\left(\frac{1}{2}\left(\Phi + \delta_{max}\right)\right)}{\sin\left(\frac{1}{2}\Phi\right)}$$

Refraction in a scattering geometry –

Scattering of sunlight by a spherical water droplet:





(a)

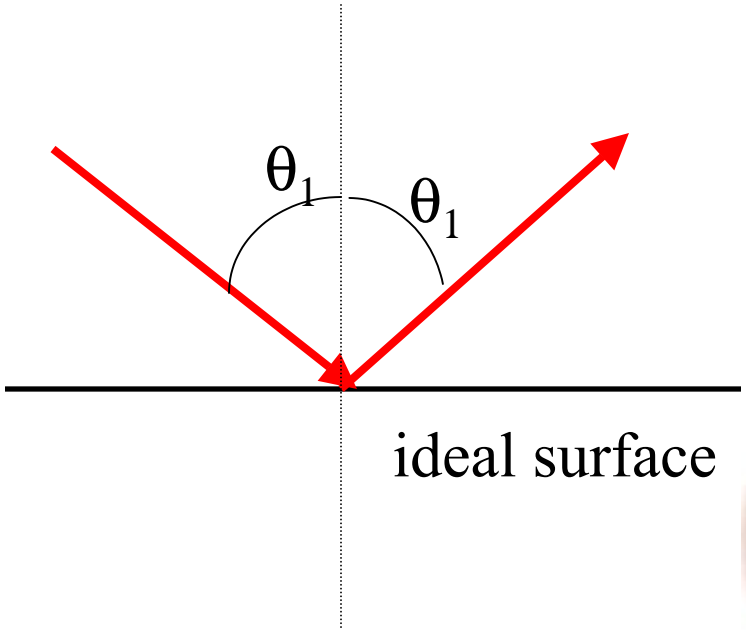
Peer instruction question

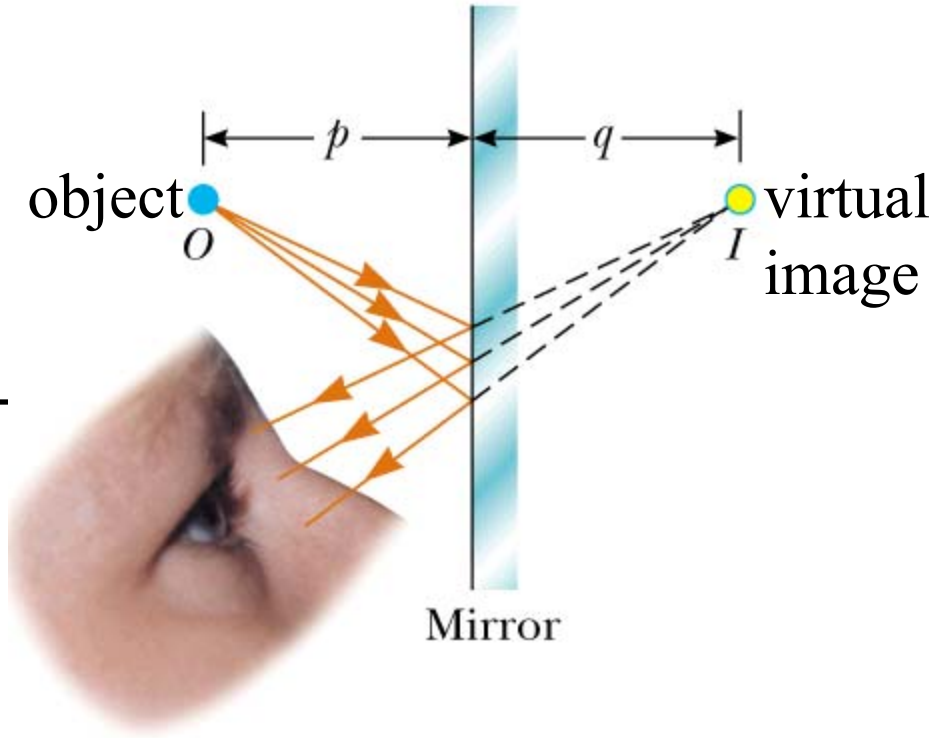
Suppose the conditions are right – rain and sunlight -- for you to see a rainbow. Where should you look for the the rainbow?

(A) Toward the sun (B) 90^o from the sun direction

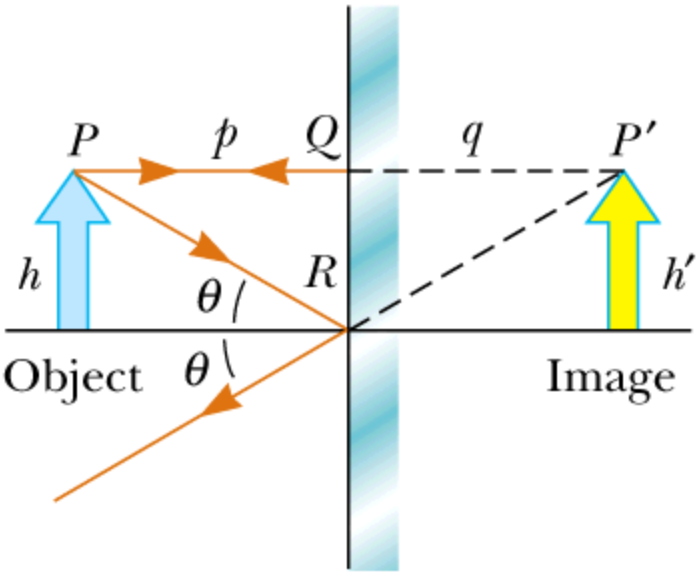
(C) 180^o from the sun direction

Images formed from reflected and refracted light





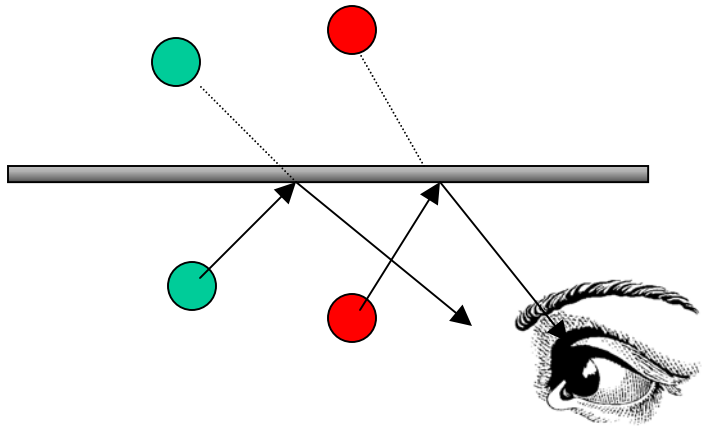
Analysis of mirror image



Using geometry:

$$q = p \qquad h = h'$$

Mirror symmetry:



Compare – 180° rotated image:

Terminology:

Virtual image -- perceived image but no light can be detected at the location of the virtual image

Real image - - light can detected at the location of the real image