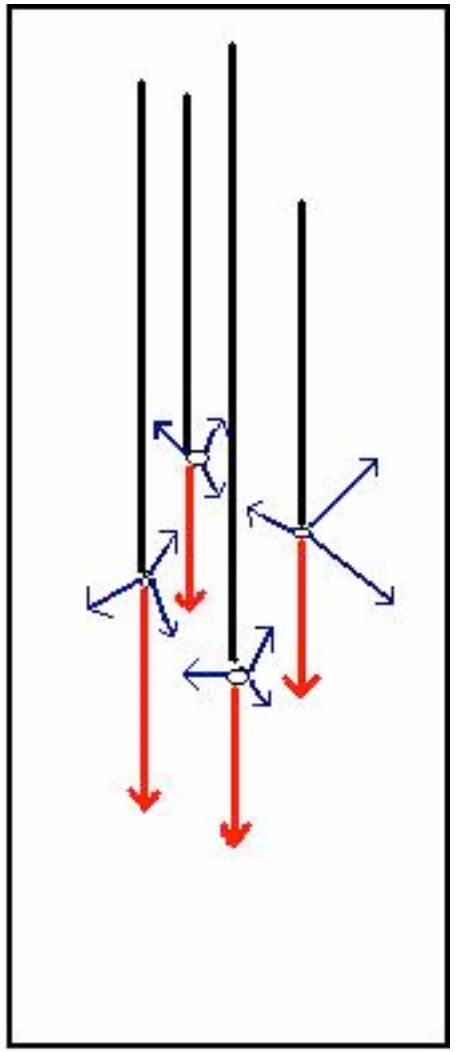
PHY385-H1F Introductory Optics

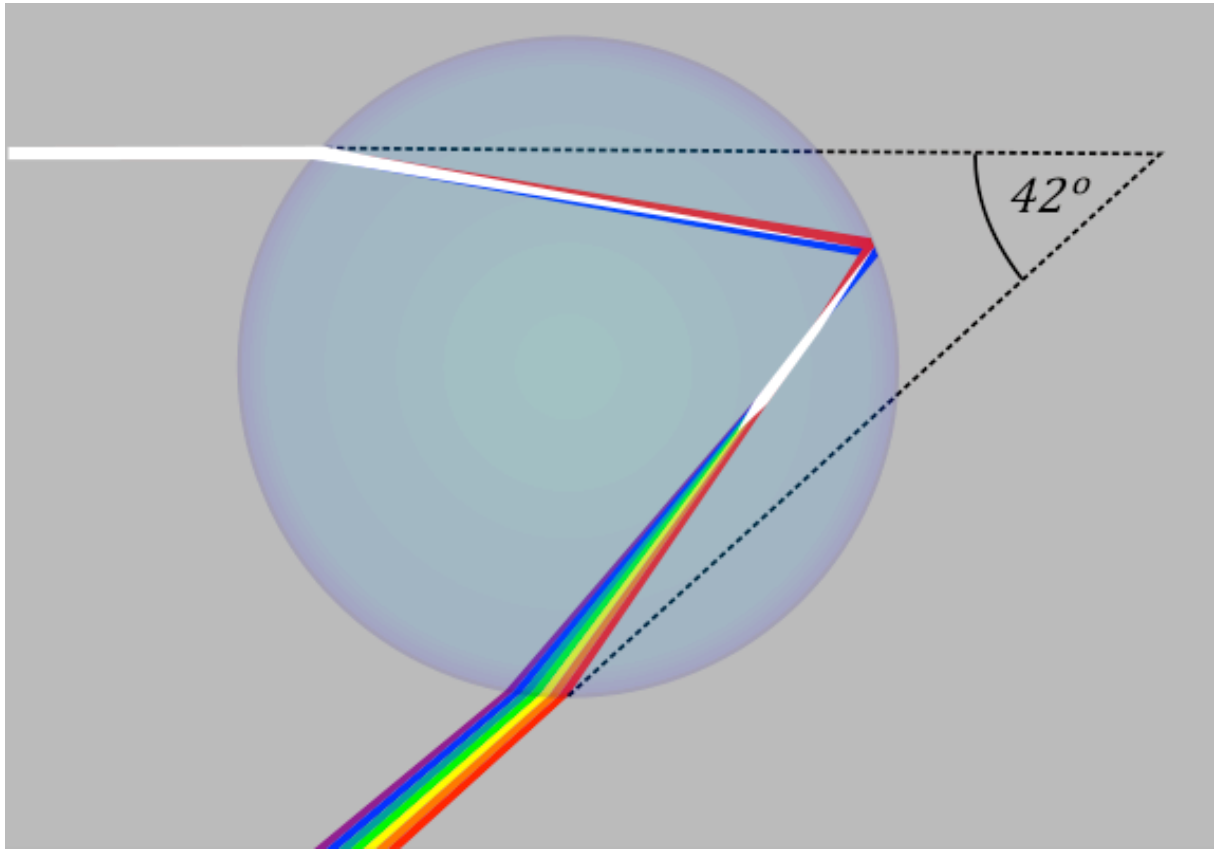
Class 6 – Outline: Sec. 4.1, 4.2, 4.3

- Handing back Problem Set 1 (marks are on portal)
- Rayleigh Scattering
- Phase lag
- Huygen's Principle
- Reflection of Wave Fronts
- Phase shift upon reflection



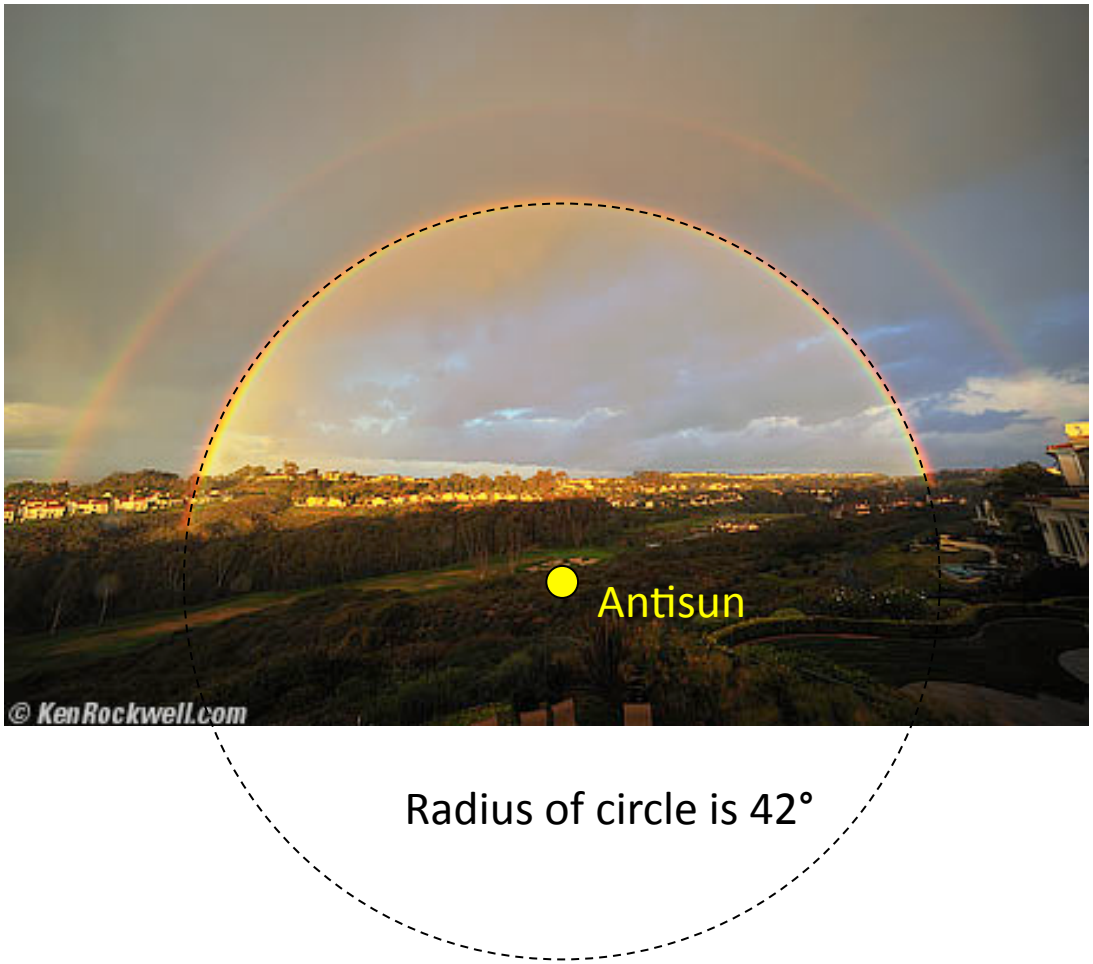
In-Class Task from Last time.. I asked:

You see a big rainbow, arcing over the Northern horizon. The sun is behind you, to the South. Is red on TOP or on the BOTTOM of the rainbow arc?



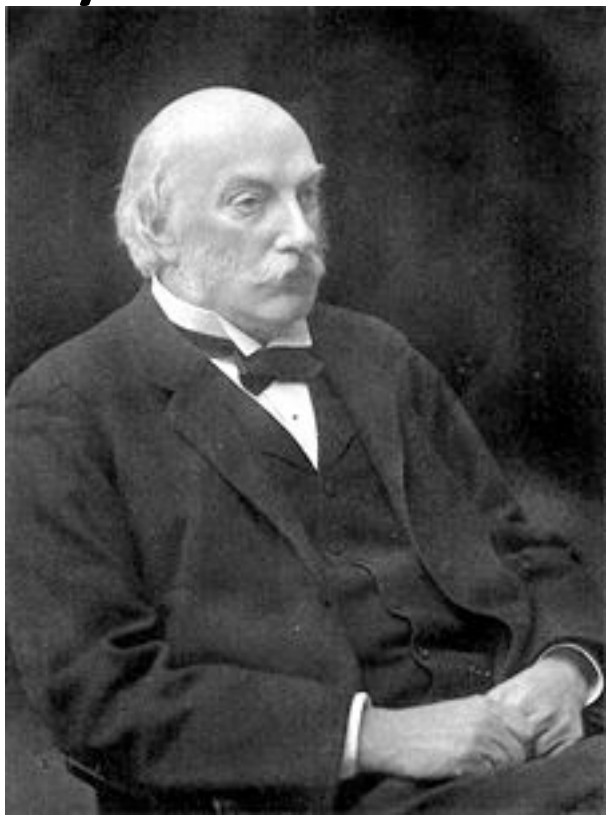
In-Class Task from Last time.. I asked:

You see a big rainbow, arcing over the Northern horizon. The sun is behind you, to the South. ***Red is on TOP of the arc.***



“Daddy, why is the sky blue?”

- Rayleigh scattering is elastic scattering of light by particles much smaller than the wavelength of light.
- Scattering intensity is proportional to λ^{-4}
- So, shorter blue wavelengths are scattered much more readily than longer red wavelengths.
- You see blue light coming from all directions in the sky, as long as there is sunlight passing through the air above you.



John William Strutt, 3rd Baron Rayleigh

5-minute In-Class Task

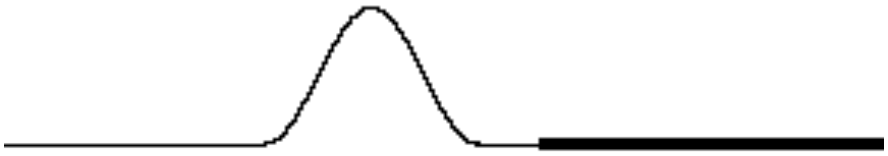
- Please take out a piece of paper that you don't mind handing to me at the end
- WRITE YOUR NAME at the top of the piece of paper
- Discussion with your friends or me during this task is ***encouraged!***

For any wave, it is true that $v = \lambda f$.

Light starts in air, where $n = 1$, and enters glass, where $n = 5$.

1. Does the speed, v, of the light increase, decrease, or stay the same when it enters the glass?
2. Does the wavelength, λ, of the light increase, decrease, or stay the same when it enters the glass?
3. Does the frequency, f, of the light increase, decrease, or stay the same when it enters the glass?

External Reflection



- Animation shows a pulse traveling to the right on a light string attached to a heavier string
- Speed suddenly decreases
- Analogous to light in air reflecting off glass surface
- Phase shift = π

Internal Reflection

- Animation shows a pulse traveling to the right on a heavy string attached to a lighter string
- Speed suddenly increases
- Analogous to light in glass reflecting off the boundary to air
- Phase shift = 0