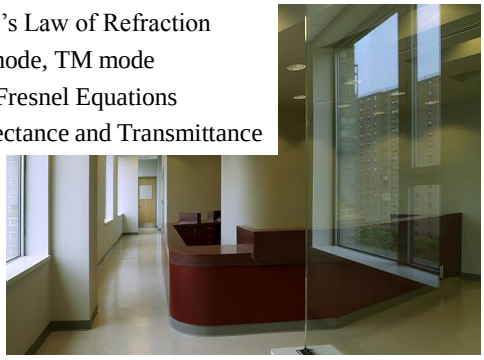
PHY385-H1F Introductory Optics

Class 7 – Outline: Sections 4.4, 4.5, 4.6

- Snell's Law of Refraction
- TE mode, TM mode
- The Fresnel Equations
- Reflectance and Transmittance

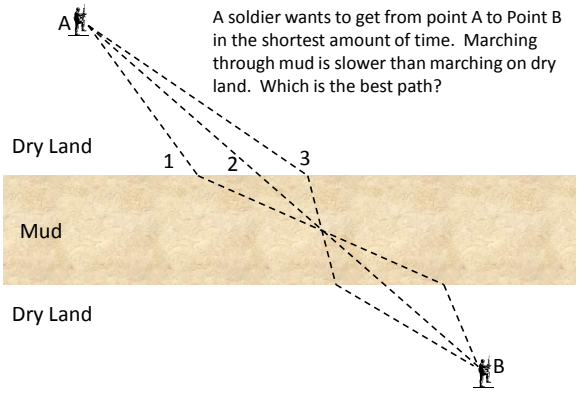


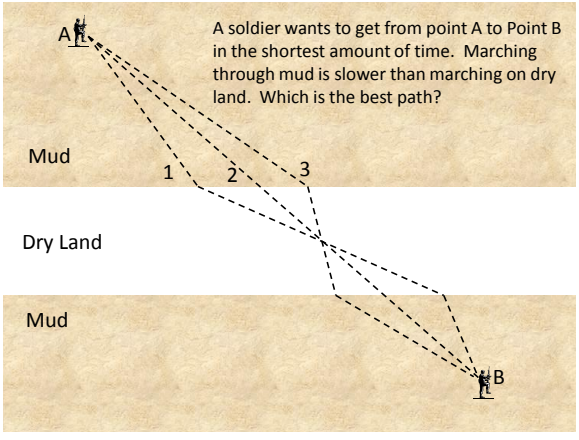
External Reflection ($n_2 > n_1$)

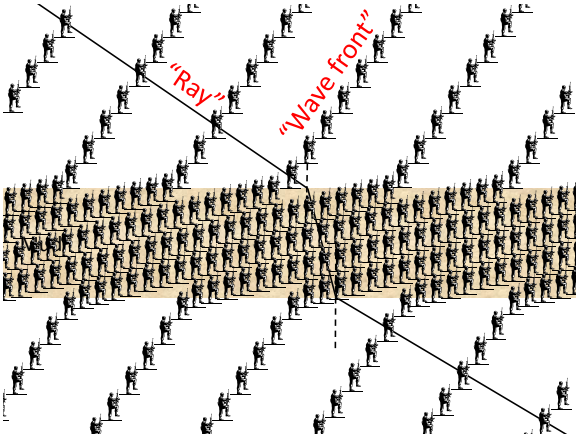
- Animation shows a pulse traveling to the right on a light string attached to a heavier string
- Speed suddenly decreases
- Analogous to light in air reflecting off glass surface
- Phase shift = π

Internal Reflection ($n_2 < n_1$)

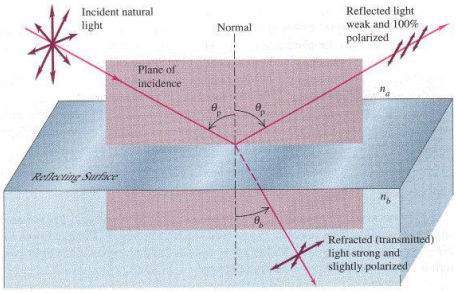
- Animation shows a pulse traveling to the right on a heavy string attached to a lighter string
- Speed suddenly increases
- Analogous to light in glass reflecting off the boundary to air
- Phase shift = 0







The incident, reflected and transmitted beams each lie in the "plane-of-incidence".



This figure shows the polarization for the particular angle of incidence called Brewster's Angle, θ_p.

"Polarization"

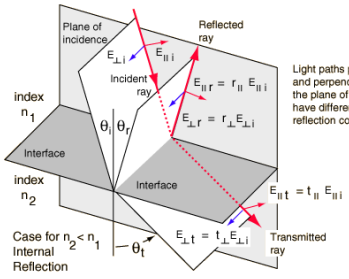
What do you think?

1. Both light and sound waves can be polarized.
2. Light waves can be polarized, sound waves cannot.
3. Light waves cannot be polarized, but sound waves can.
4. Neither light waves nor sound waves can be polarized.

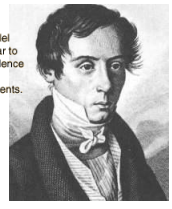
Why?

Recall Class 1: History of Light

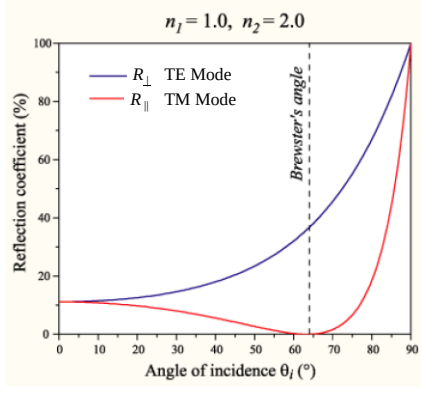
- 1814 – **Jean Fresnel** used the idea of polarization to predict amplitudes of reflected and transmitted light from glass interfaces.



Light paths parallel and perpendicular to the plane of incidence have different reflection coefficients.



Reflection Coefficient, External Reflection



Reflection Coefficient, Internal Reflection