Physics of Surfing

Prof. Volker Crede

Prof. Christianne Beekman

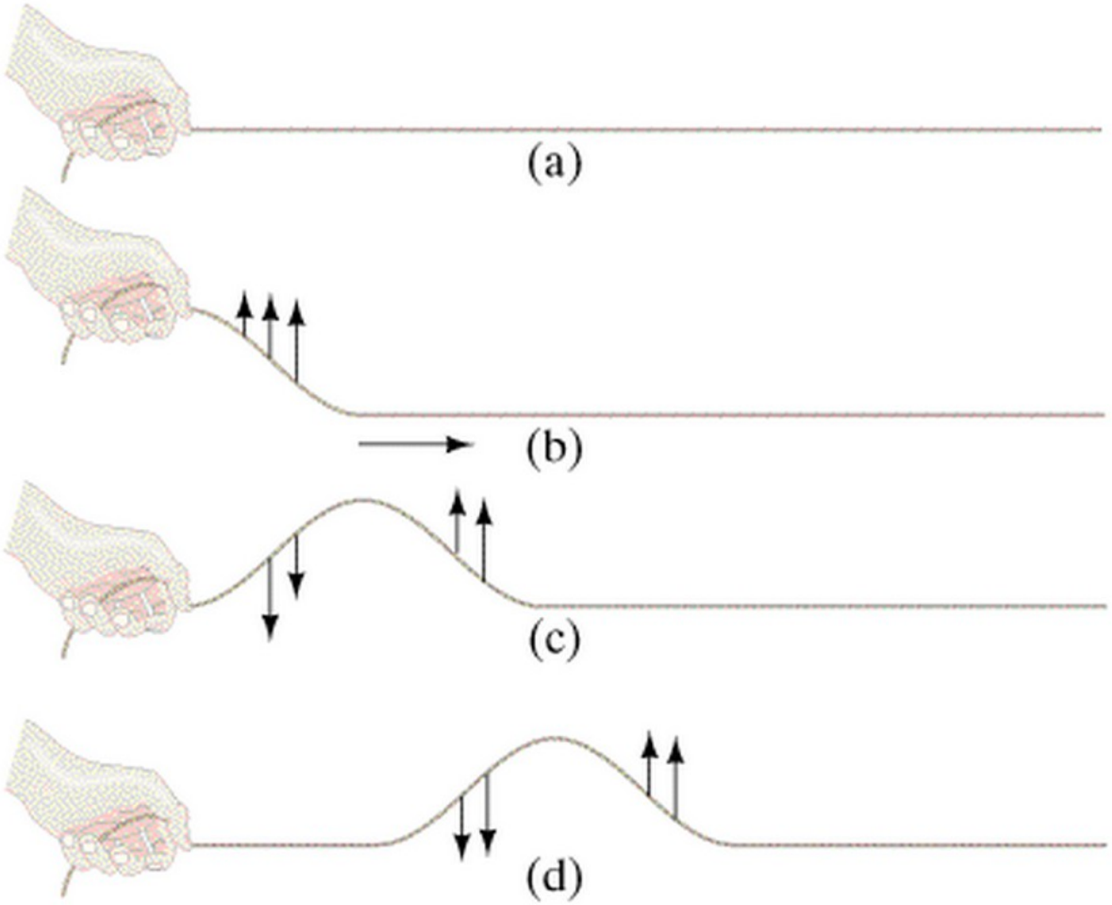
Saturday Morning Physics

Physics of Waves

- What's a wave?
- Wave properties.
- Kinds of waves.
- Cool things waves do.

What's a wave?

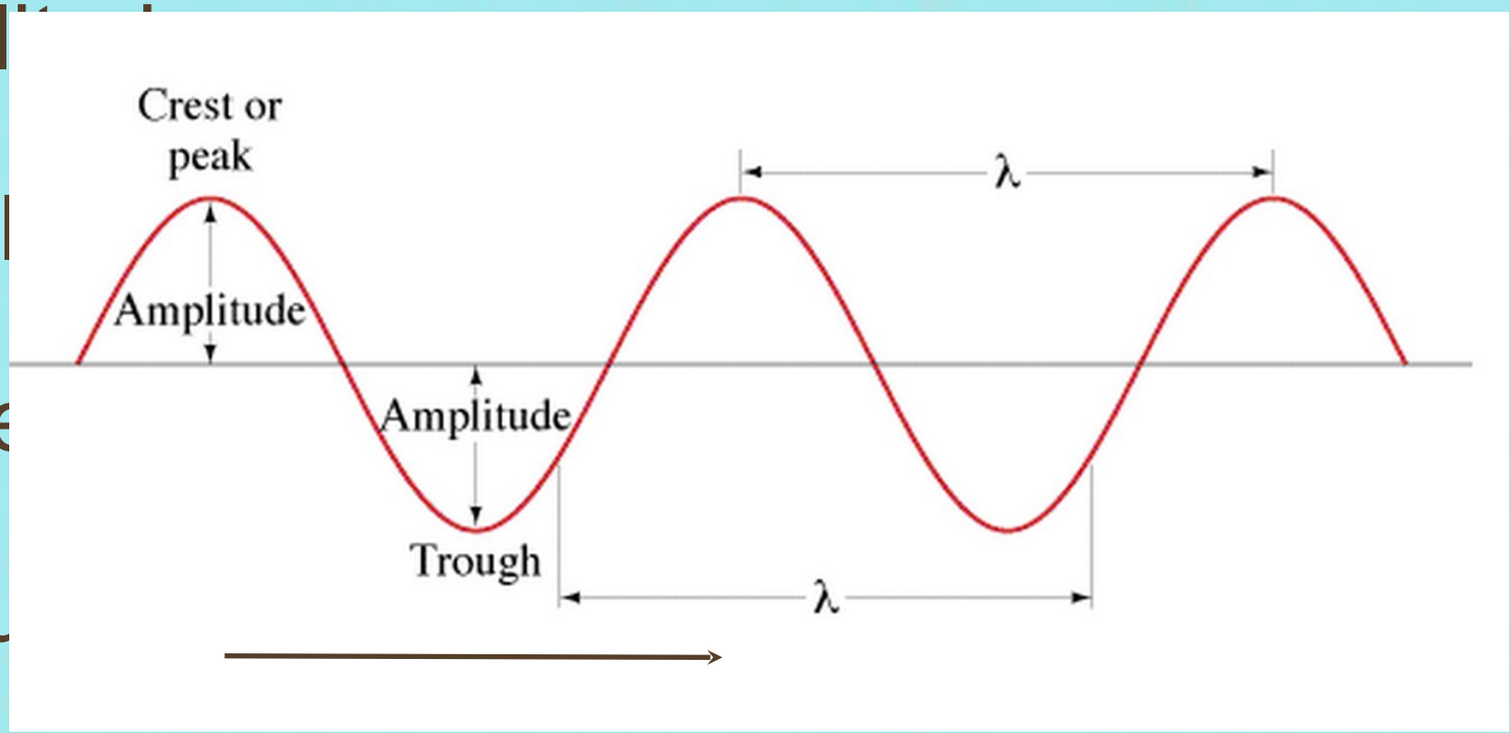
- A material,
- that has a restoring force,
- and a perturbation.



Demos!
Wave Machine

Waves have:

- Ampli
- Wavel
- Spe
- Frequ



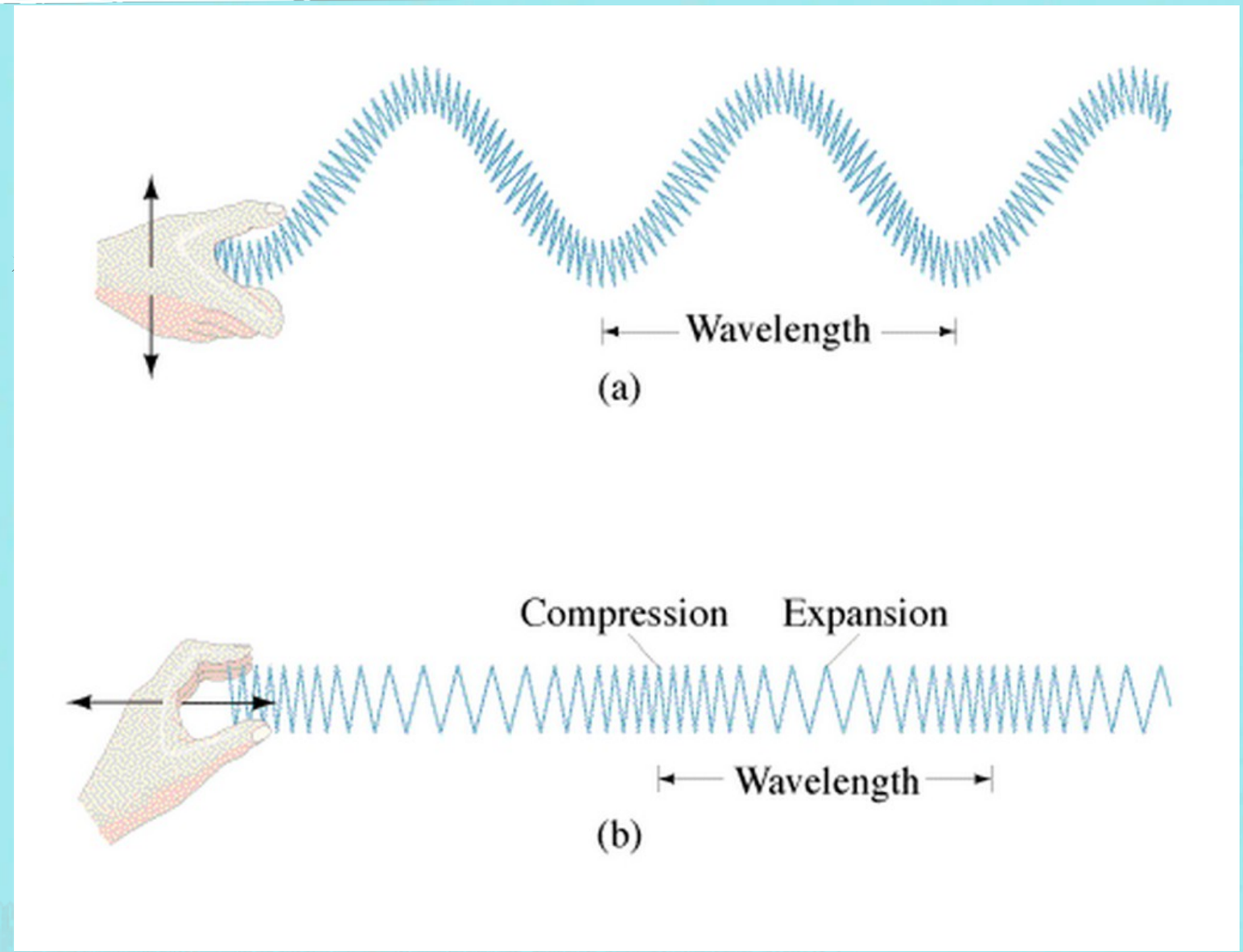
Demos!
The drill thing
Fire Tube

Demo wave properties: Guitar

- Amplitude: volume
- Frequency: pitch that one hears
- Wavelength: frets on the guitar
- Speed: different strings
- Frequency = Speed/ Wavelength

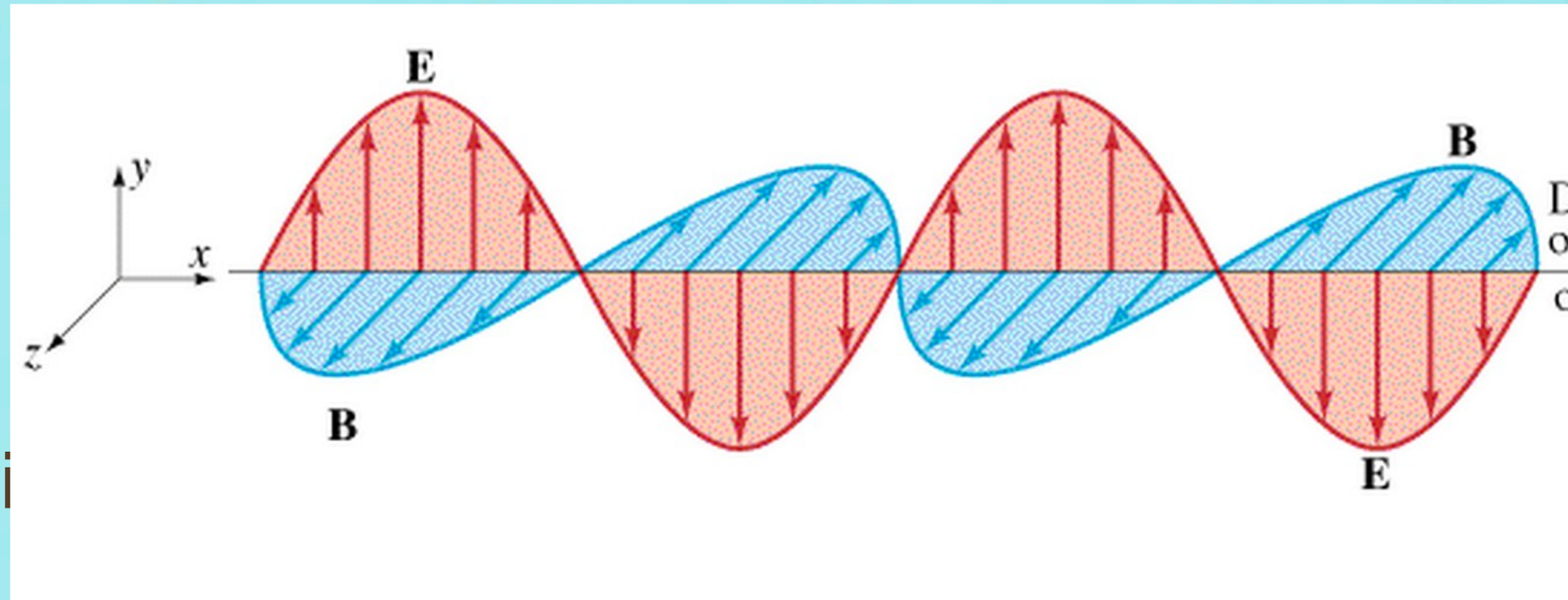
More Demos!
Guitar

Kinds of Waves



Kinds of Waves

- Transverse
- Compressive
- Rotational
- Electromagneti
- Many more!



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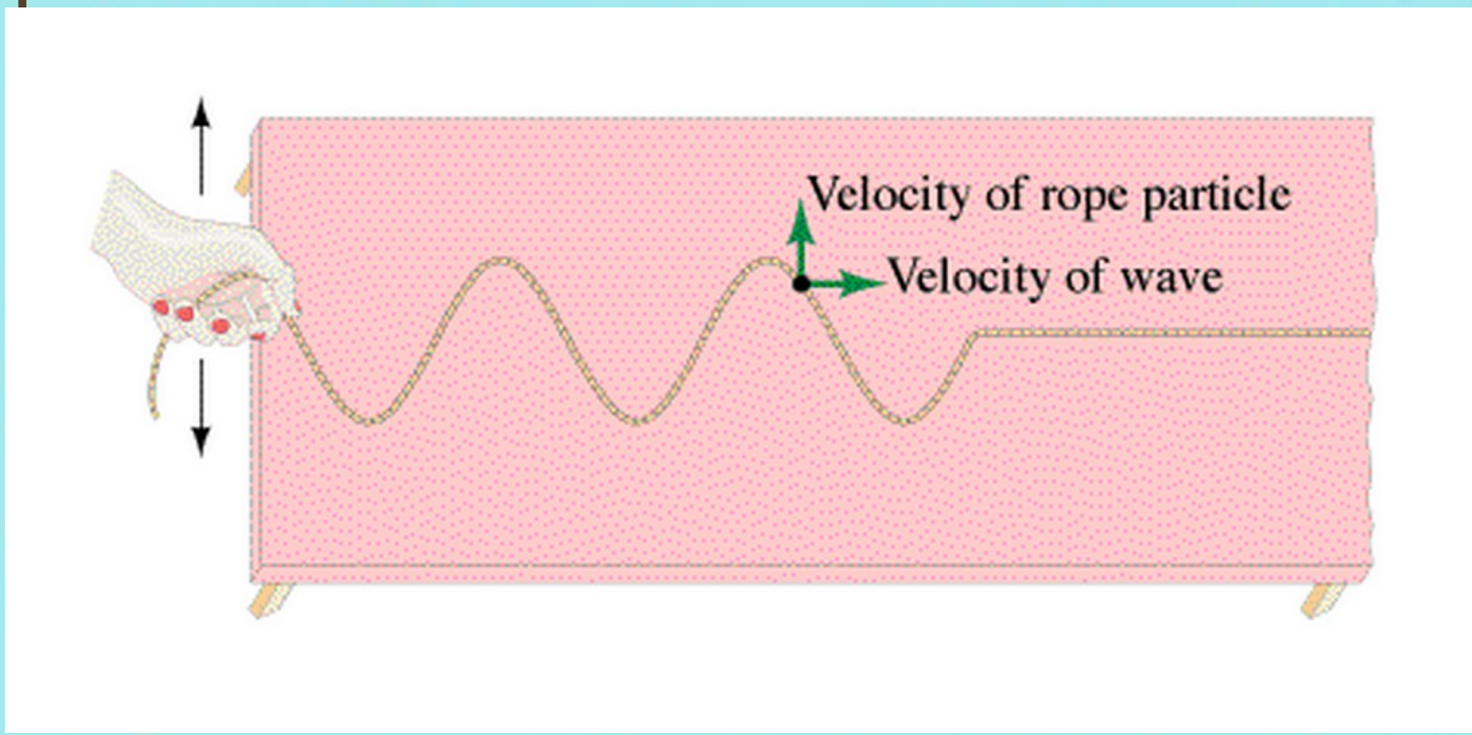
Spiral Density Waves! M51

Cool things waves do

- Travel
- Reflect
- Resonate
- Interfere
- Polarize
- Refract (bend, based on wave speed)
- Diffract (self interference)

Traveling

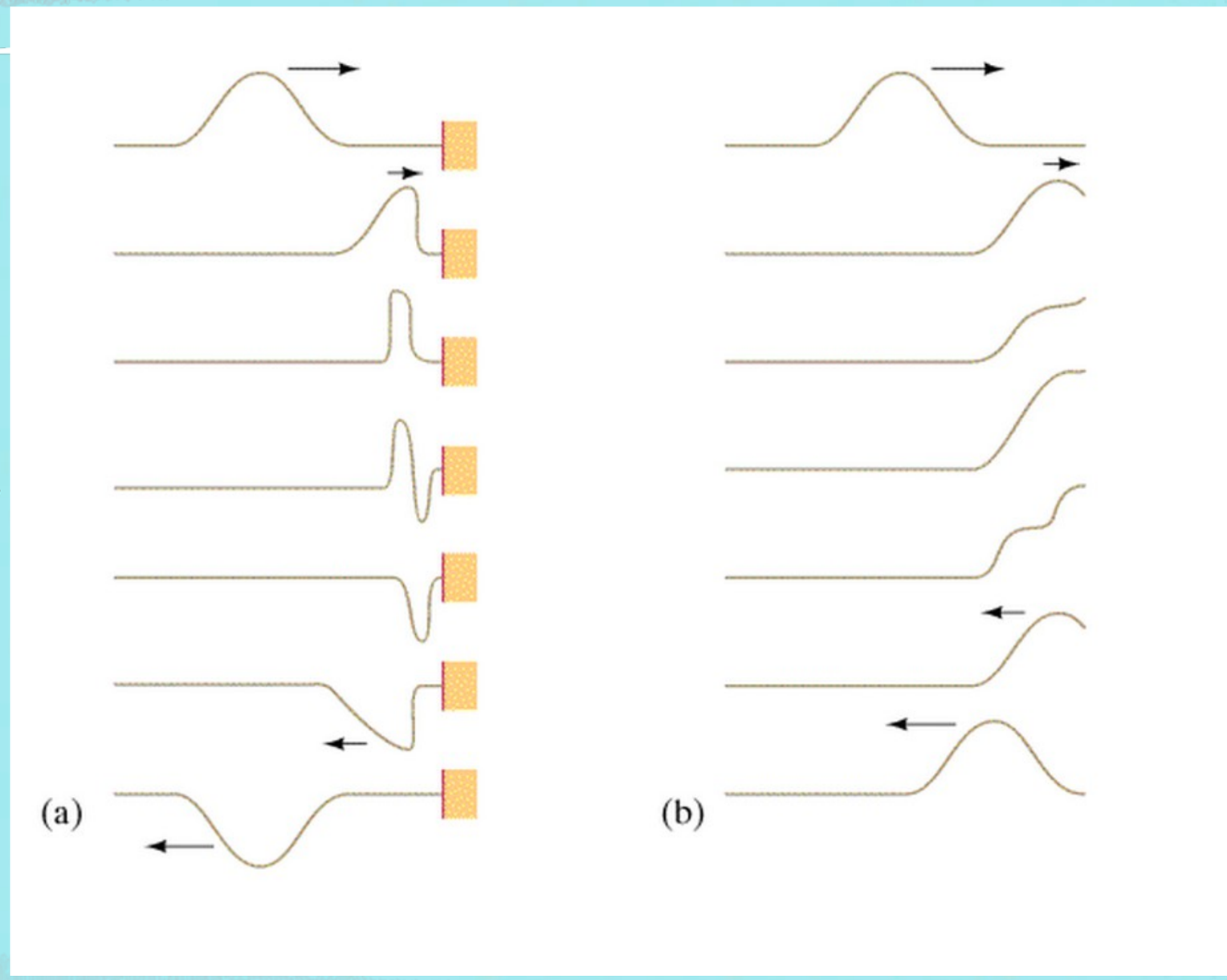
- Waves travel, but the particles don't (much)



Demos!
Those pendulums again

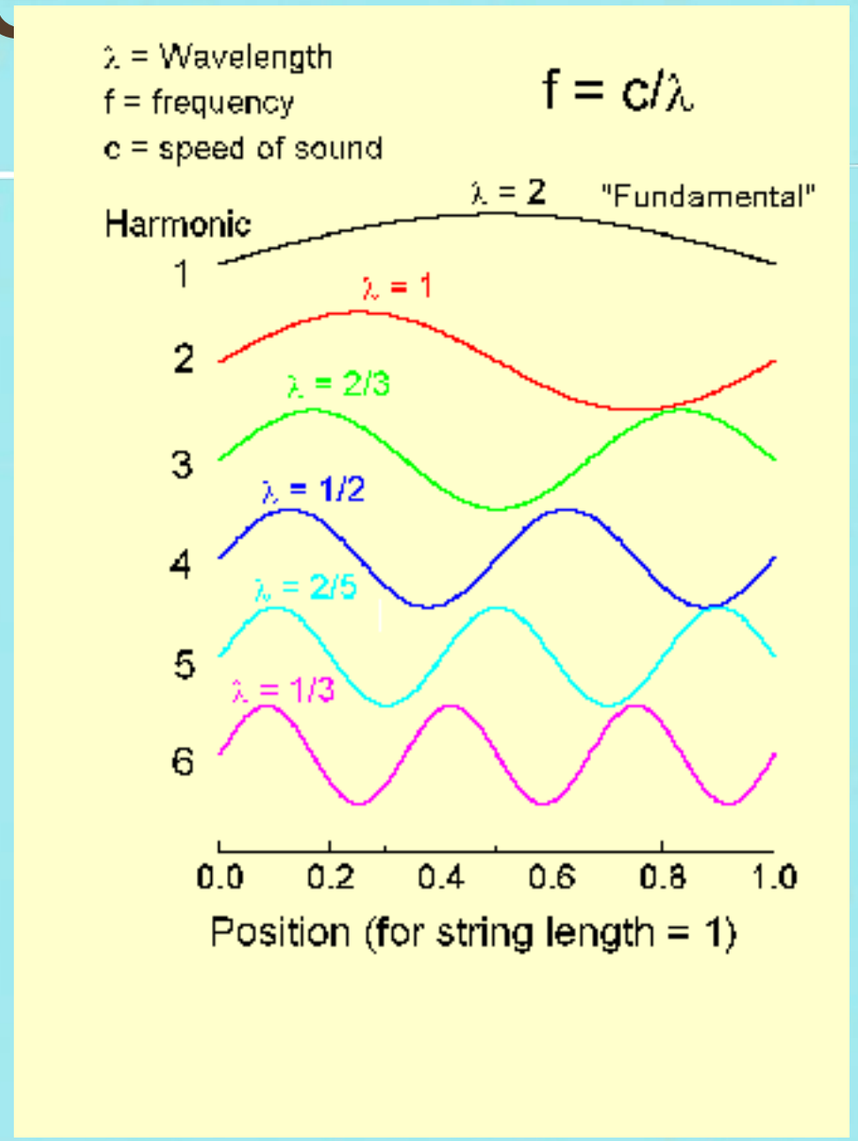
Reflection

- At a change of medium, waves reflect
- This is useful, now you can hear my voice.



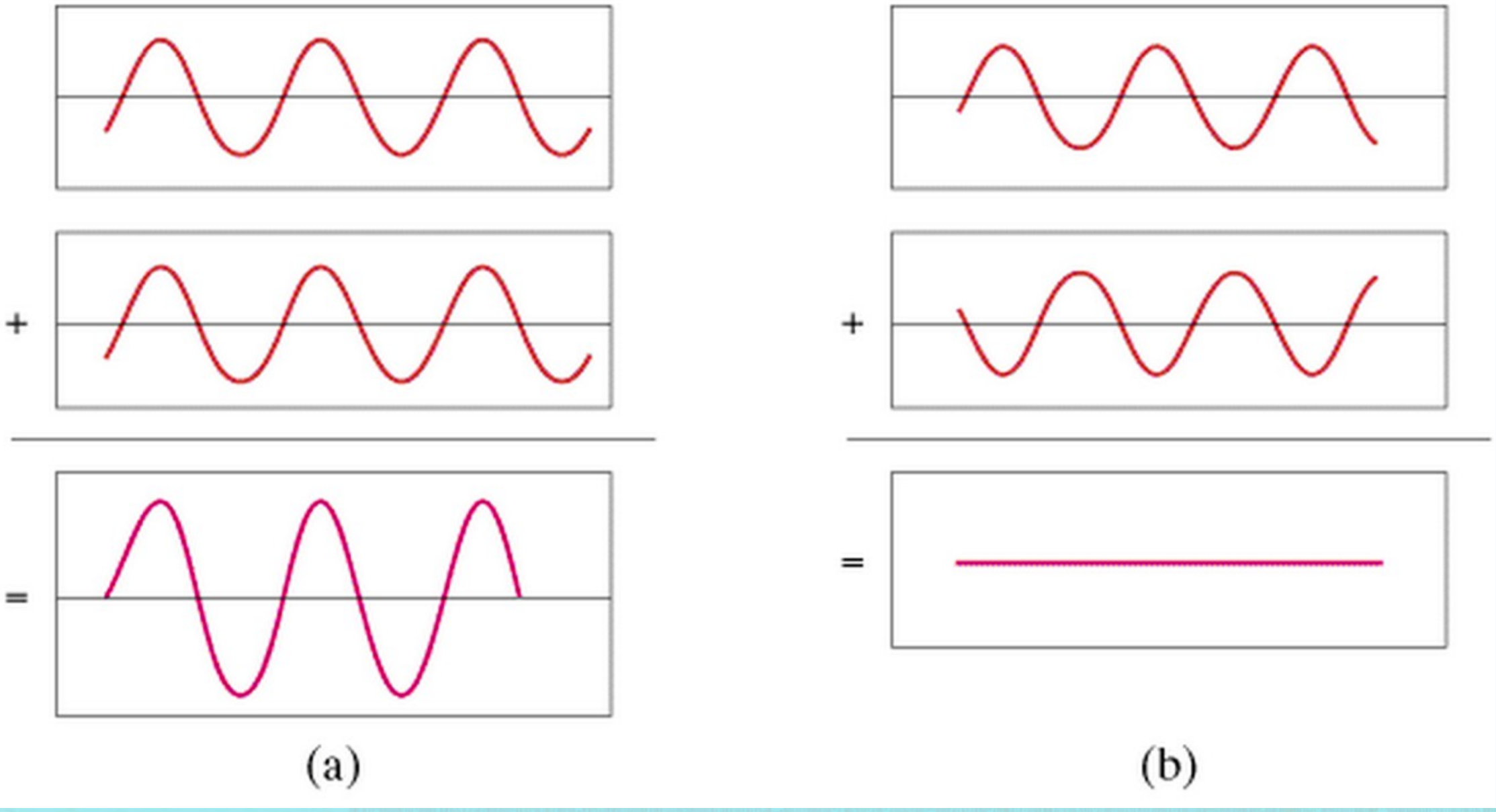
Resonate

- Only some waves are permitted, based on the boundary conditions
- Overtones!

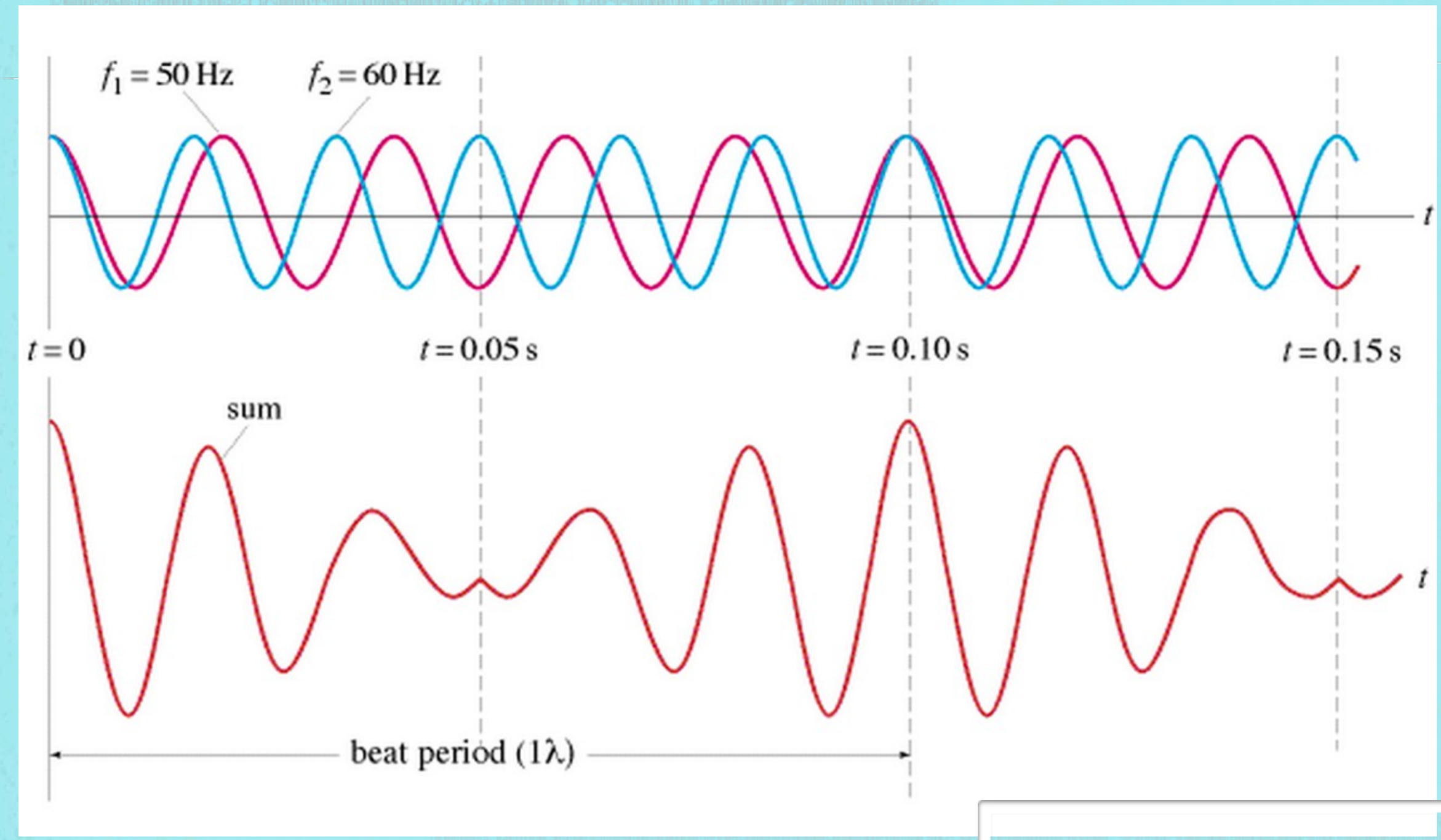


Demos!
Trombone, tubes, glass

Interference



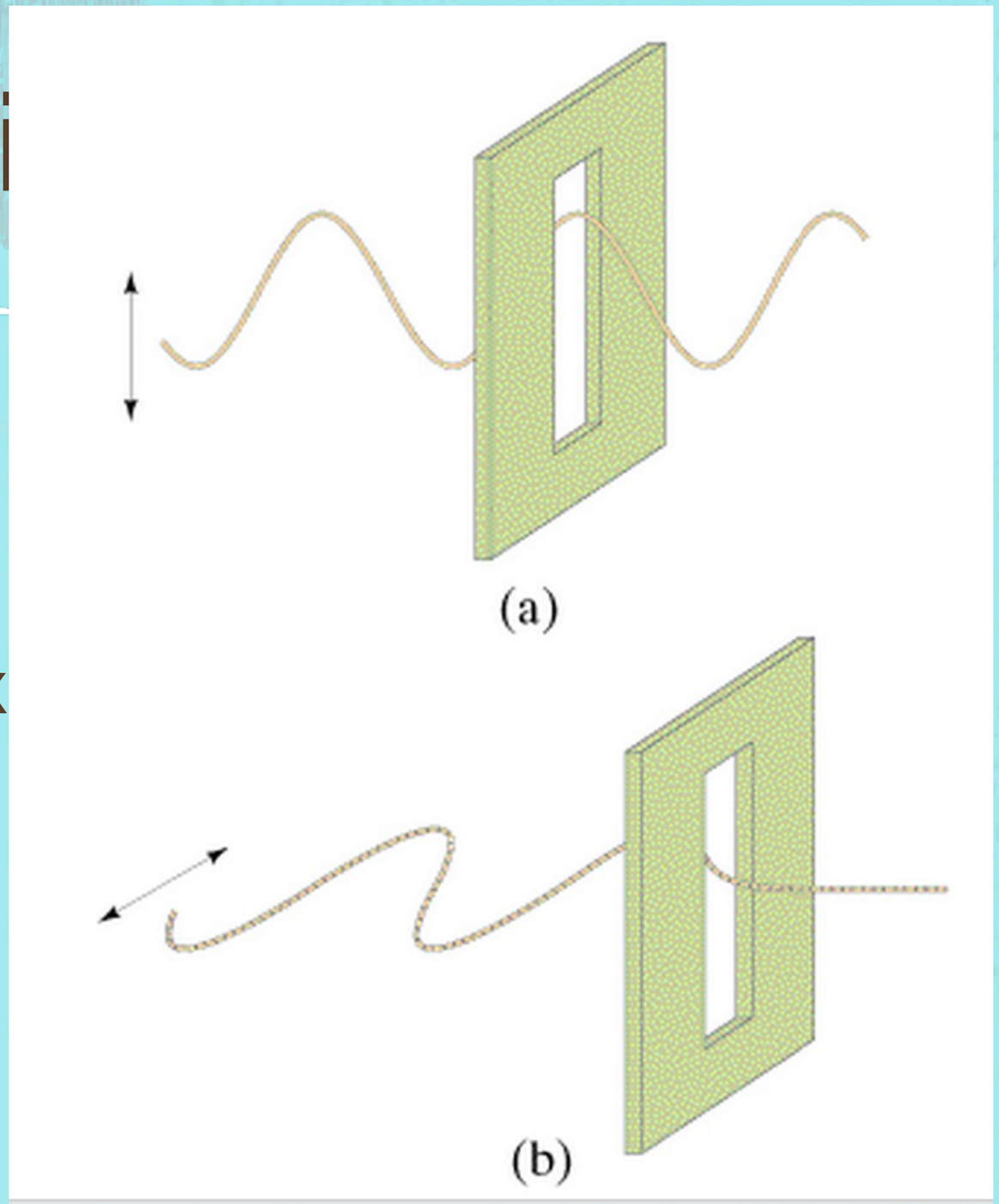
Interference



Demos!
Tuning forks,
more guitar

Polari

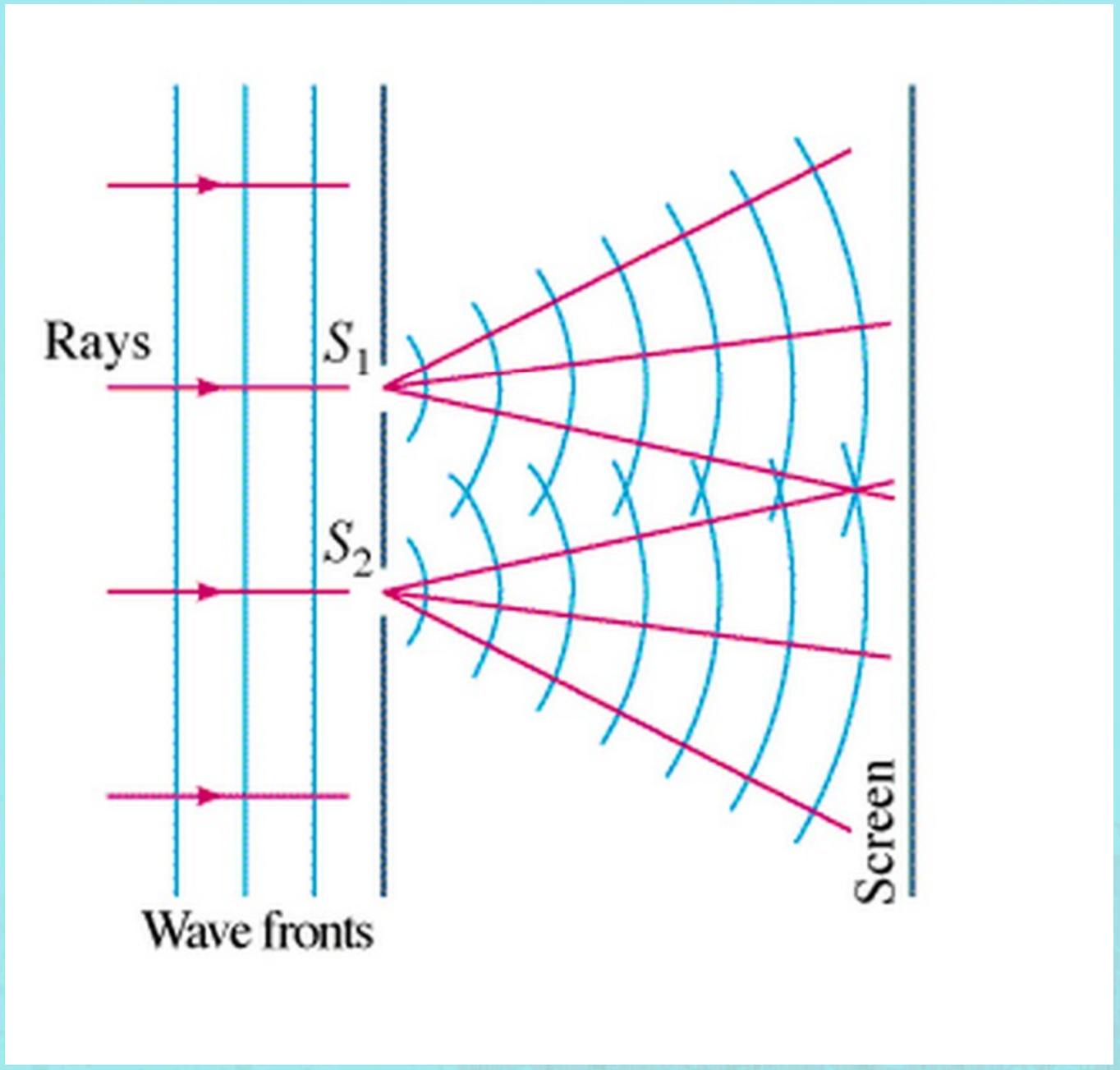
- Transverse waves have a transverse direction.
- Sunglasses! (More in the nex part)



Demos!
Polarizer

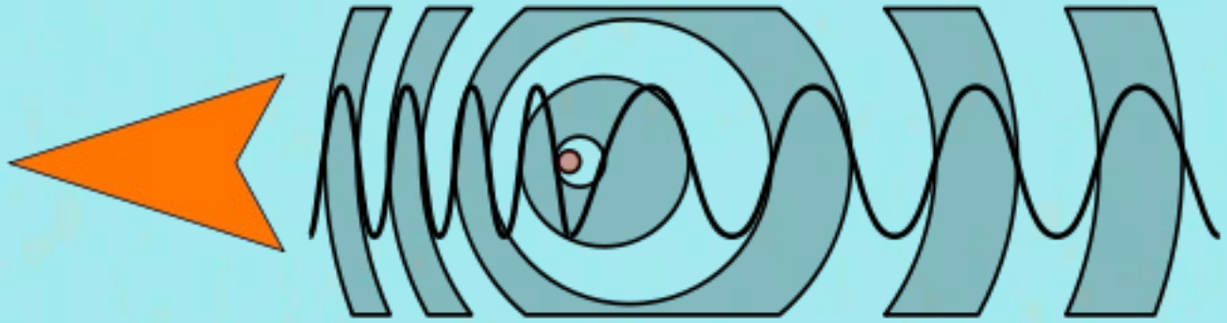
Diffraction

- Interference with ITSELF!



Demos!
Wave pool

Doppler Shift!



Dispersion!

- Refraction!
- Surfing!