

Scattering from a target – part 1

Today we will:

1. Review outstanding issues (homework, projects).
2. Begin to learn about active acoustics.
3. Go visit Mick Peterson's lab where we will obtain measurements of backscattering intensity of a variety of acoustic 'targets'. We will analyze these measurements in future classes.

Scattering from a target – part 1

Who cares?

Method used to study organisms mass and distribution.

Method used to study sediment mass and distribution.

Method used to study boundaries.

Used by organisms (Dolphins, Bats) – called eco-location

Scattering from a target – part 1

What in the oceans is likely to scatter sound?

Think: sound speed &/or density change

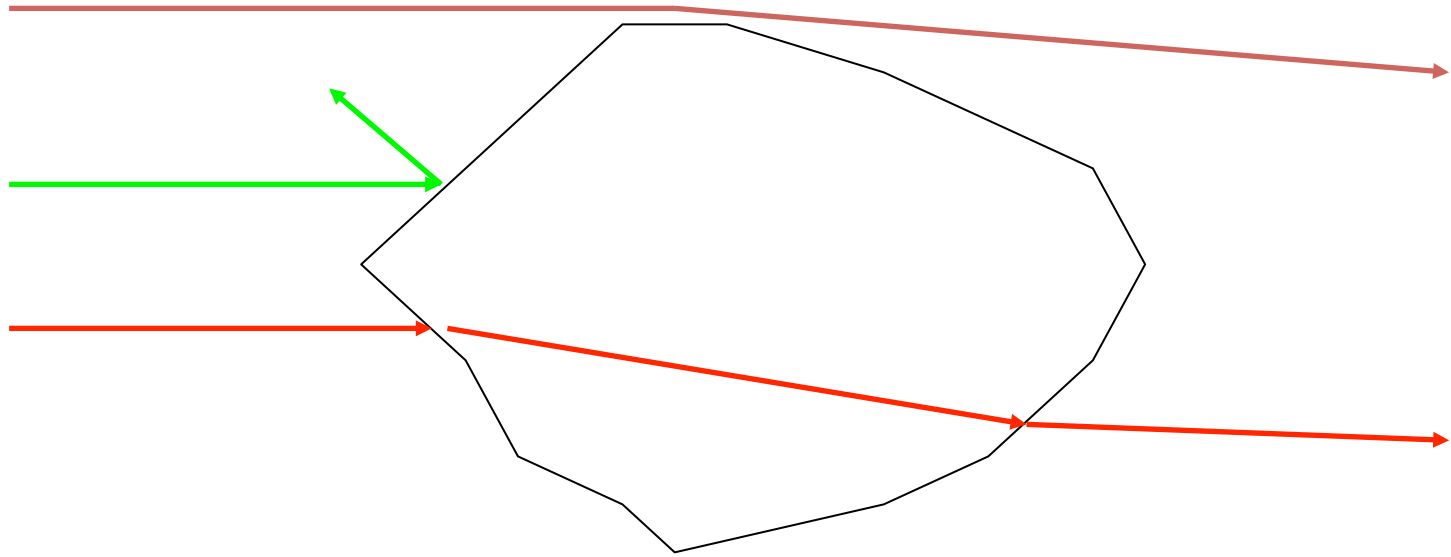
What happens to sound interacting with ‘material’?

- a. absorbed (energy changes form).
- b. scatters (redirection).

The combined effect is called attenuation.

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refraction, reflection and diffraction:

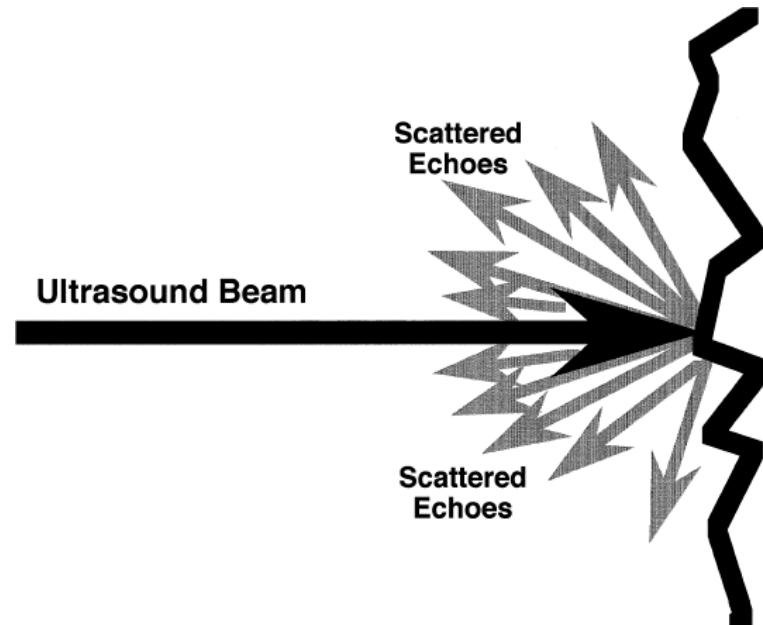
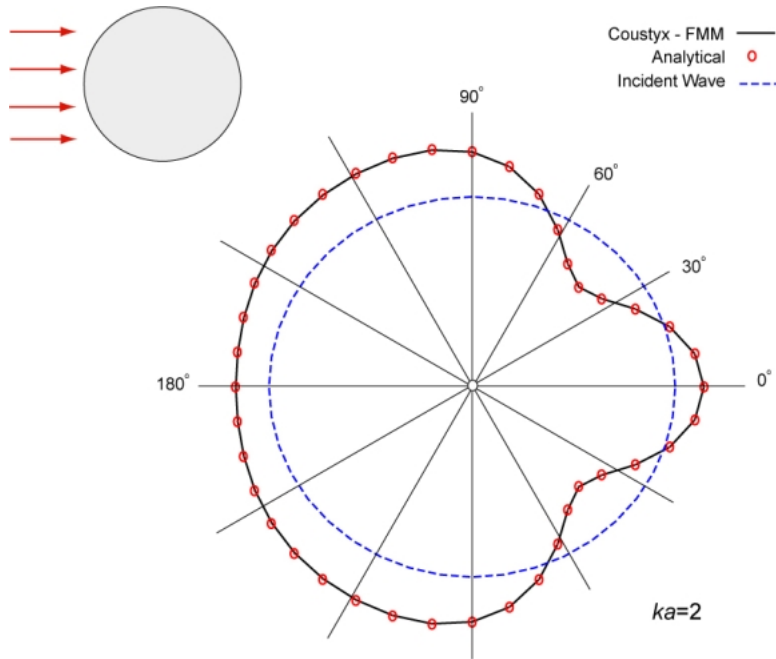


Scattering is the 'sum' of:

1. **Reflection:** at a boundary of a particle with different c than the medium in which it is embedded, a certain amount of radiation is reflected back.
2. **Refraction:** at a boundary of a particle with different c than the medium in which it is embedded, a certain amount of radiation penetrates into the particle, usually at a different angle than the angle of incidence.
3. **Diffraction:** the light propagating along the boundary of the particle responds to the boundary causing a change in direction.

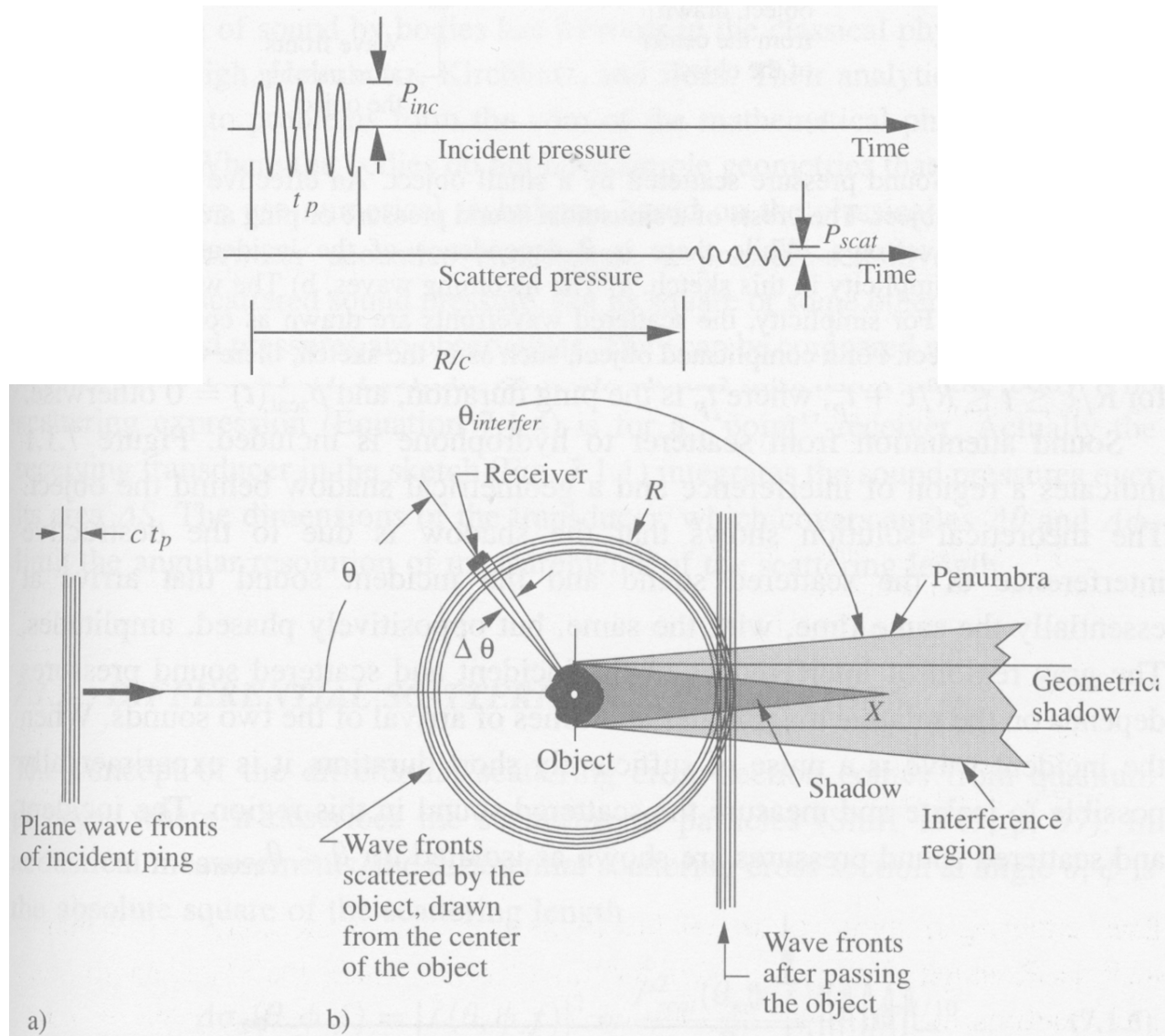
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Examples:



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Measurement of scattering:



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Two families of problems:

Forward: given a target and an incoming sound: what will be the scattering pattern/intensity of the sound?

Inverse: given an incoming sound and the scattering pattern produced, what is the likely target?

The inverse is chronically ‘under-determined’ requiring prowess and ingenuity.

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Today:

We will obtain measurements of sound scattering at 180 degrees from different kinds of sphere (composition and size).

In the near future:

We will compare the measurements between the spheres and will see if they are consistent with theoretical calculations (published models that compute what scattering should be).