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Sound, Vibration, Resonance, and Sonic Wonders

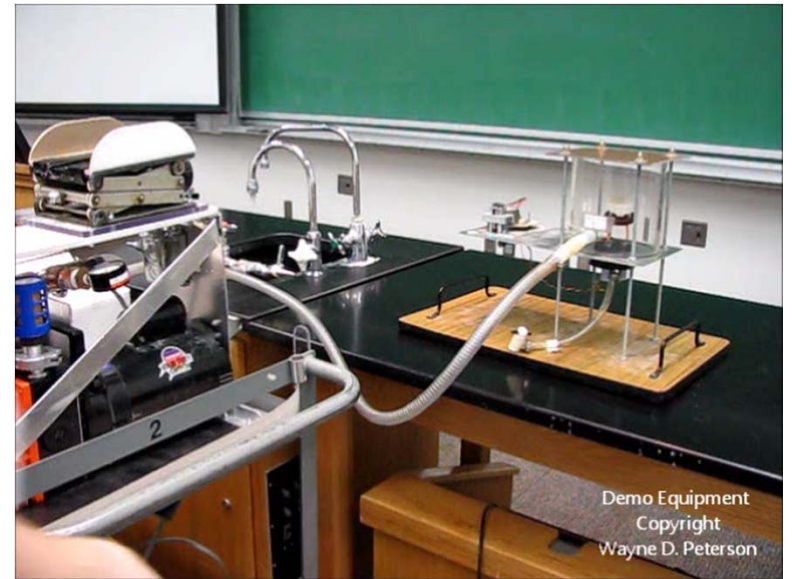
Brian E. Anderson, Ph.D. Acoustics
Research Scientist

How does sound travel?

**at the
Tokyo Summerland Wave Pool**



Slinky



Human Hearing Frequency Range

Sarah McLachlan



20 Hz 

25 Hz 

30 Hz 

35 Hz 

40 Hz 

50 Hz 

60 Hz 

130 Hz 

260 Hz 

1 kHz 

2 kHz 

3 kHz 

12 kHz 

13 kHz 

14 kHz 

15 kHz 

16 kHz 

17 kHz 

18 kHz 

19 kHz 

19.5 kHz 

20 kHz 

Dog Tone

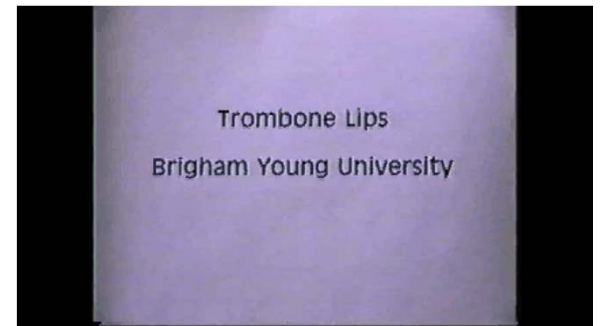
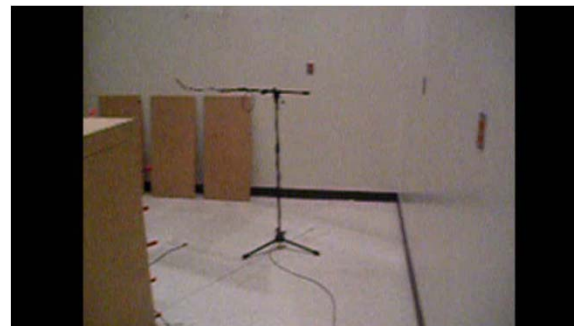
Special Acoustics Rooms



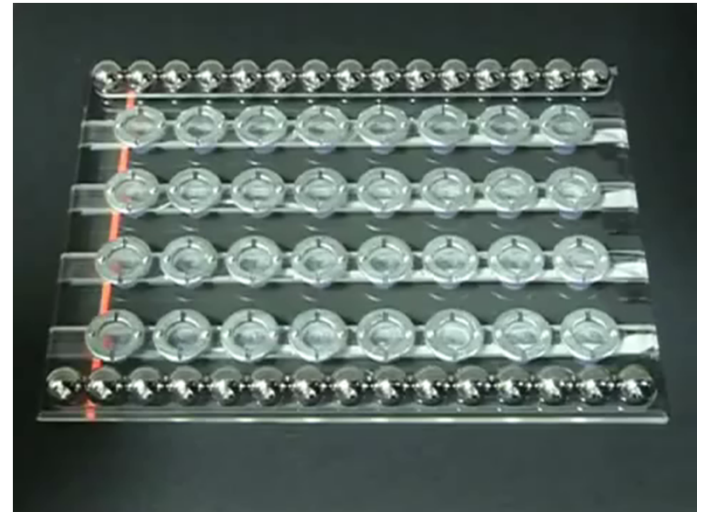
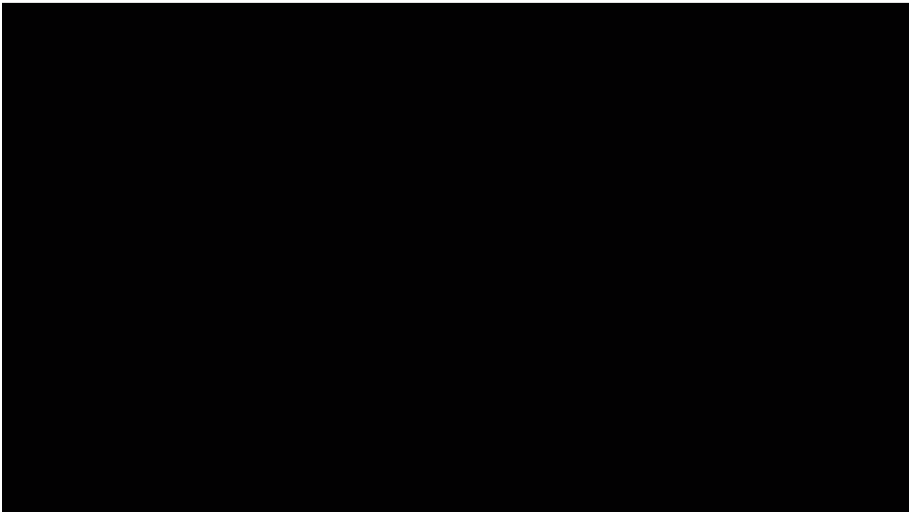
Resonance Demos

- Wine Glasses
- Singing Rods
- Himalayan Bowls
- Cream Soda Bottles
- Whoopie Cushions and Pipes

Resonance



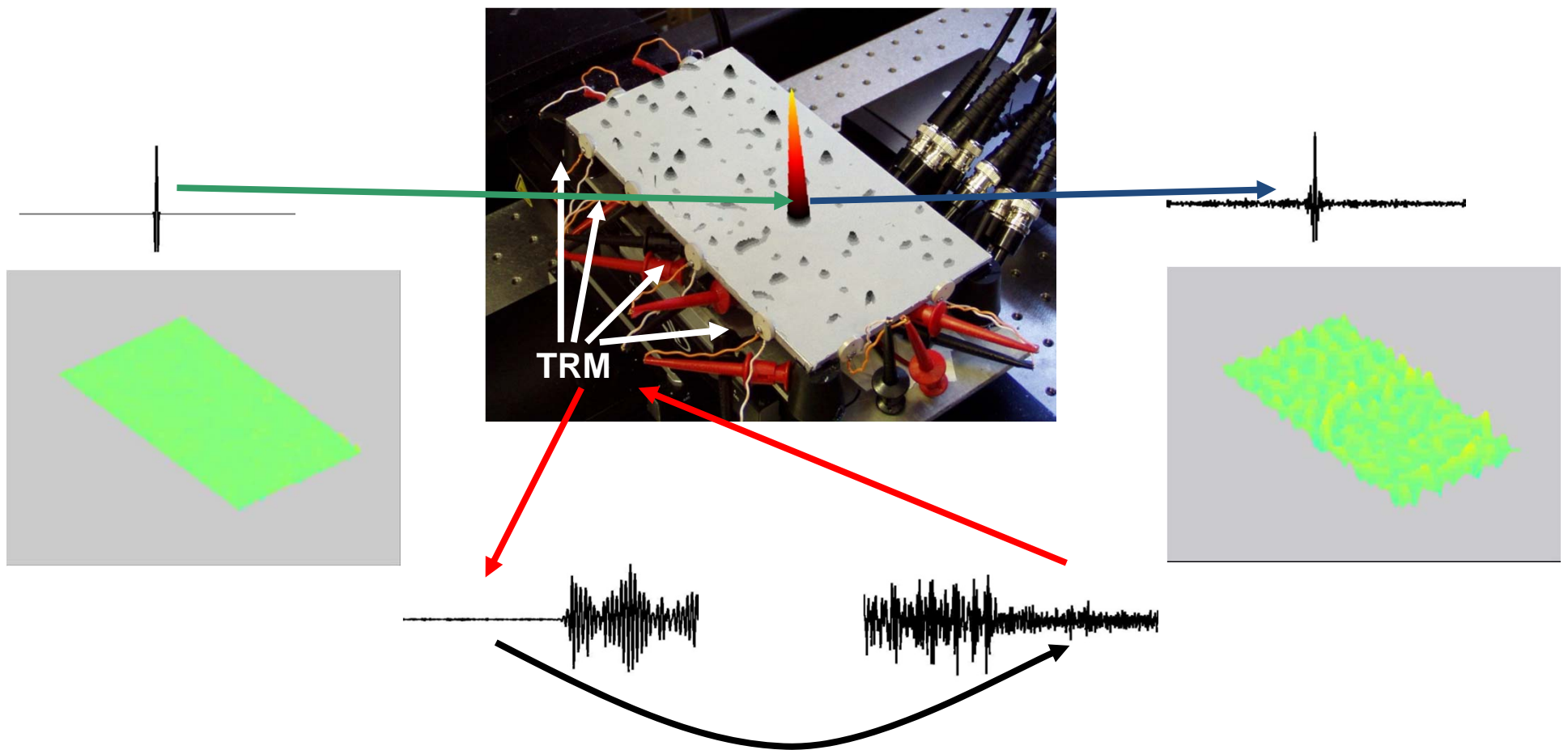
Music with Simple Things



Fancy(er) Speakers & Spying...

- Parametric Array
- Vibration Speaker
- Laser Doppler Vibrometer

Time Reversal Acoustics



Lego Minifigure Weapon

- 6' x 4' x 0.25" aluminum plate
- Single source transducer
- Laser vibrometer aimed at the "bad guy"
- Focus is 7 cm from null to null



Lower Amplitude



Higher Amplitude



Careers in Acoustics

- Concert Hall and School Classroom Designers
- Musical Instrument Designers
- Loudspeaker/Microphone Designers
- Ultrasound Imaging (Babies and Defect Imaging)
- Seismologists studying earthquakes
- Acoustic Refrigerators
- Hearing Science (Audiology) & Speech Science
- Submarine SONAR (ocean mapping, animal tracking, warfare)
- Noise Doctor (cities, transportation, wind mills, jets/rockets)
- Acoustic Levitation and Moving Objects
- Making Objects “Invisible”
- Spying

Musical Illusions

Circularity in Pitch



Speech to Music

