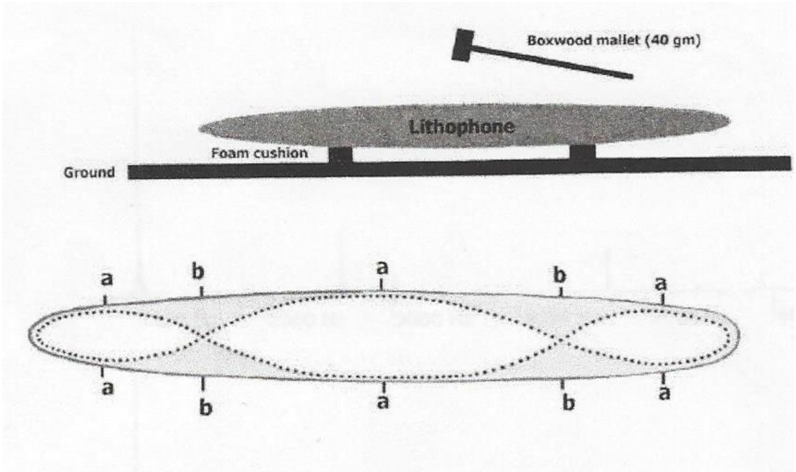
ACOUSTICAL AND PHYSICAL PROPERTIES OF LITHOPHONES

(Based on Brown: 2014 and Caldwell: 2013)

HOW DO SOUND WAVES MOVE THROUGH LITHOPHONES?



(From Caldwell 2013: 524)

Sound waves travel through cylindrical lithophones in sinusoidal curves that form two small lobes bracketing a larger central lobe (see "a" areas above). The clearest fundamental tones are produced when the lithophone is struck in the middle of one of the three "a" lobes.

Dull zones: The surface of the instrument around the points where each sound wave crosses itself, forming pinch-points, is acoustically dull (see "b" locations above). These two dull zones on a lithophone are the only places along a cylindrical lithophone where it can come in contact with another medium without breaking the integrity of its sound waves. The lithophone can be played by holding or suspending it at these dull zone locations, or it can be placed on ropes or other materials on these points.

WHAT MATERIAL TYPES HAVE THE BEST ACOUSTICAL PROPERTIES?

- Schists (chlorite-schists, schist-actinolites)
- Basalt (including Jemez)
- Phyllite
- Gneiss
- Limestone (argillaceous, dolomitic)
- Petrified wood
- Phonolite
- Feldspar
- Amphibolites
- Quartzites
- Smectites

Most common material types used for Kiva Bells and other lithophones: schists and basalt

Material types that do NOT have good acoustical properties:

- Sandstone (low density)

PHYSICAL PROPERTIES OF LITHOPHONES WITH THE BEST ACOUSTICAL PROPERTIES:

- Homogeneous rocks and those made of dense material types
- Basically cylindrical in form
- Oval latitudinal cross-section rather than circular
- Rounded, conical or tapered ends rather than flattened ends
- Most resonant when approximately 4.5 times longer than wide
- Diameters generally between 4 and 8 cm
- Variability in length changes pitch more than variability in width

References:

Brown, Emily J.
2014 *"A Sound Like That of Bells": Lithophones in the Southwest. In* Enduring Curiosity, Generous Service, Papers in Honor of Sheila K. Brewer. Edited by Emily J. Brown, Carol J. Condie, and Helen K. Crotty. *Papers of the Archaeological Society of New Mexico* 40.

Caldwell, Duncan
2013 A Possible New Class of Prehistoric Musical Instruments from New England: Portable Cylindrical Lithophones. *American Antiquity* 78(3):520-535.

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