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Cone Gnomon Shadow Experiment

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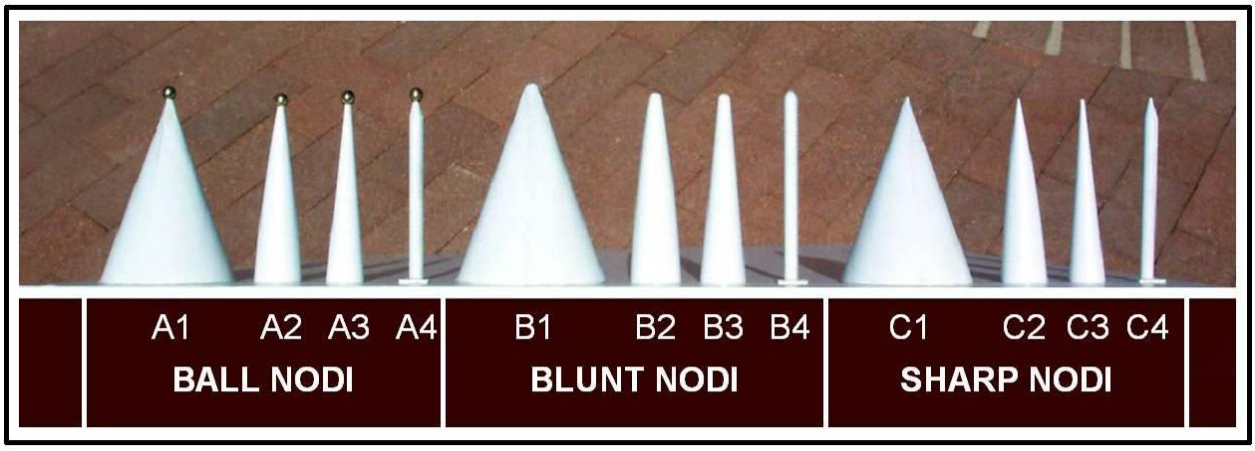
Note: This experiment expands upon my earlier shadow casting experiment that can be seen online at: http://www.advanceassociates.com/WallDial/NodusShadowExperiment.pdf

Purpose: To determine which shapes of sundial cone gnomons cast the easiest to read shadows and produce the most precise readings. I compared cones and rods with sharp, blunt, and ball nodi. And I compared wide straight sided cones with narrow straight sided cones and narrow curved sided cones. I also compared short shadows with long shadows.

Setup: I made twelve differently shaped sundial cone nodi all approximately 4.75" tall and I attached them to one edge of a large piece of foam board in a straight line so that the tips were all lined up. I marked the board with parallel black lines 4.75 inches apart as multiples of the height vs. the length of the shadows. The spheres and blunted points are 3/8" in diameter. I made the wide cones from paper and I the other cones are Estes model rocket nose cones that I modified.

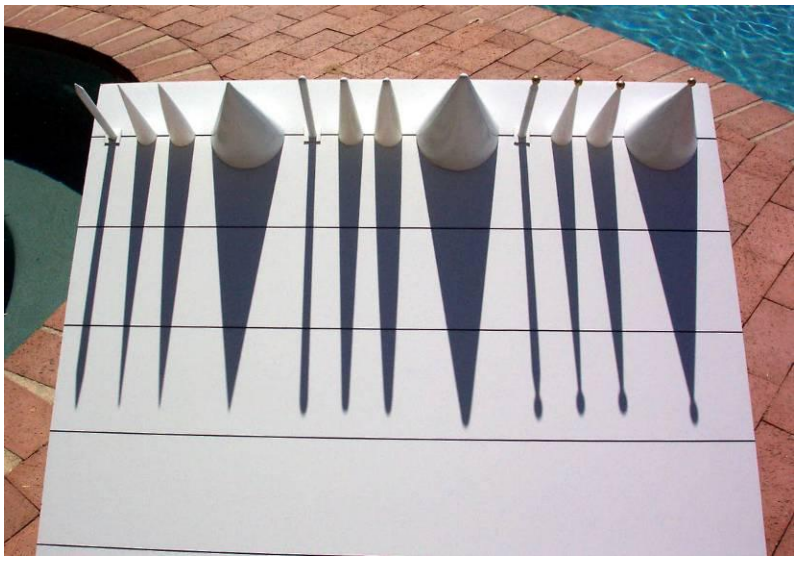
Error margin: I was not able to get all the gnomons exactly 4.75" tall, but they are close and within 1/8" of 4.75". The foam board was slightly warped and had a slight curve.



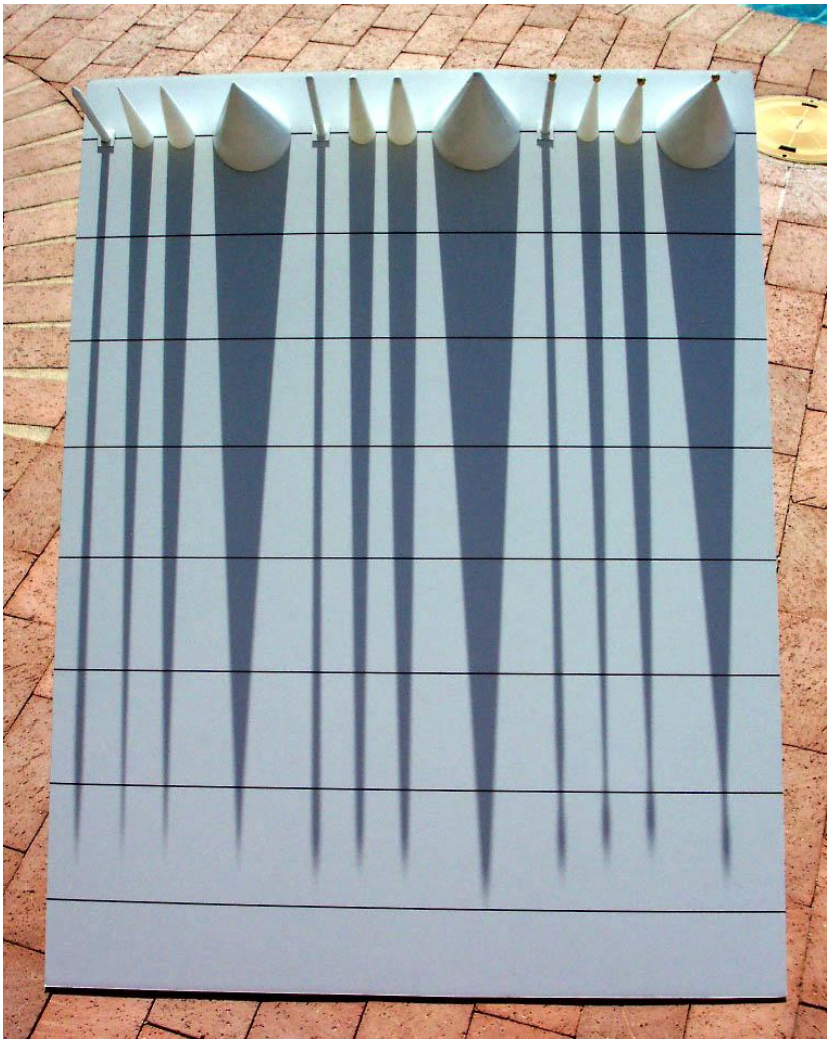
Edge-on view showing the different gnomons attached to the board

Execution: By tilting the board in the sun, I could lengthen or shorten the shadows and observe the effect that the sun's angle had on the shadows cast by the different nodi. High sun angles made short shadows and low sun angles made long shadows.

Conclusions: Cone shadows are more visible at a distance than rod shadows. The wider the cone, the easier the shadow is to see from a distance. Sharp points produce long shadows that are too short (less accurate) and are harder to read at a distance because they are so thin. Blunt cones or rods produce more accurate long shadows. All of the gnomons in the experiment produce precise easy to read short shadows. Ball nodi are harder to read than blunt or pointed nodi, especially when the shadows are long.



Overhead view showing the different gnomons with short shadows



Overhead view showing the different gnomons with long shadows