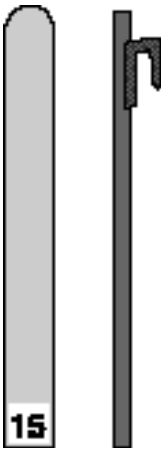

Figure 1

Version I. A Marker That Can Hang from the Cove

The marker can be a wood, cardboard, or plastic strip, about 5 centimeters wide and 40 centimeters tall. Fasten a hook on the back so that the marker can be hung on the cove to mark a position on the horizon. The markers should be numbered or lettered, so that participants can remember which one is their own. See Figure 1. The markers could also be attached by having small pieces of Velcro® attached to the back, and a band of the mating material all around the dome at the horizon. In a portable planetarium, it's best to attach the "hook" component of the Velcro® on the markers, and the "loop" or fuzzy part on the dome.

Version II. Sticky Paper Dots or Squares

This fast, cheap alternative to a prepared marker is being used by many planetariums, particularly small units and portables. Your nearest stationery store will have rectangles in various sizes (3M Post-it® notes) as well as self-adhesive disks in many sizes and colors (Avery is a major brand). Fluorescent red dots in the 3/4 inch diameter size work well for portable planetariums. A few dollars will purchase a supply of a thousand dots.

The only trick is to choose material in a color and size that is easily visible in a dim planetarium, and has the right degree of stickiness. Too weak an adhesive can mean markers not sticking or falling off too soon, especially if the dome is dirty; too strong an adhesive might mean work for you cleaning them off after each program.

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2. Stonehenge Alignment Indicators on the Dome

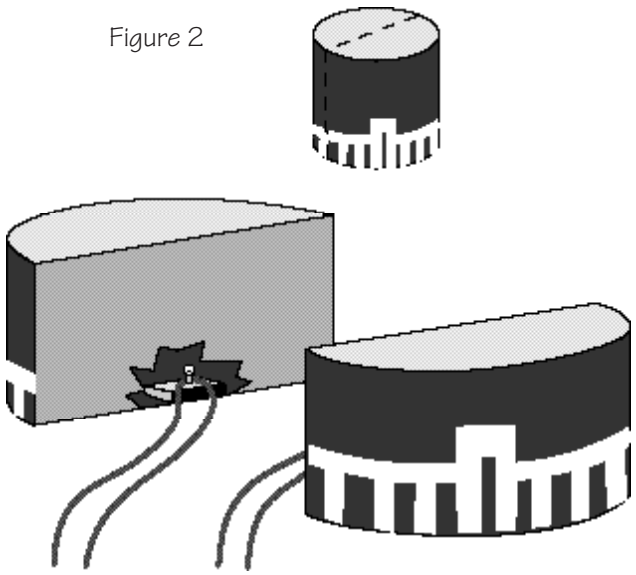
The alignment indicators are four simple rectangular archways, like the Stonehenge "trilithons," projected or fabricated of cardboard. They are placed so that the planetarium's Sun will rise and set in these openings on the solstices, the longest and shortest days of the year, at the latitude of Stonehenge, 51 degrees north. The solstices are usually June 21 and December 21, although variations in our calendar with respect to the actual motion of the Earth around the Sun vary the actual dates by a day or so from year to year.

Version I: A Cardboard-drum Silhouette Projector

See Figure 2. A drum-shaped ice cream container, from your local ice cream shop, makes a fine structure for this projector, but any cylinder will do. You can cut the cylinder into two parts, along the axis, so that each half can project over half of the dome without the main star projector getting in the way.

The cutout Stonehenge outline does not have to be precise except in one feature: the larger archway openings must line up with the extreme northern and southern risings and settings of the Sun in your planetarium when set for the latitude of Stonehenge. The outline you will project cannot be a straightforward representation of Stonehenge

Figure 2



in any event, since Stonehenge consists of several concentric rings of stones. Thus this projector is not intended to show a literal Stonehenge horizon, but rather to represent four of the key alignments which are discussed in the program.

You'll need to experiment with your cutouts so that the archway openings are in the correct horizon positions, and then mount the projector securely so that the alignments are not changed by mistake. A check immediately before the program is advised.

A simple silhouette/shadow projector like this produces a very impressive result. Even the unevenness in brightness of the projected shapes serves to good effect, appearing to represent the worn, pitted surfaces of the stones.

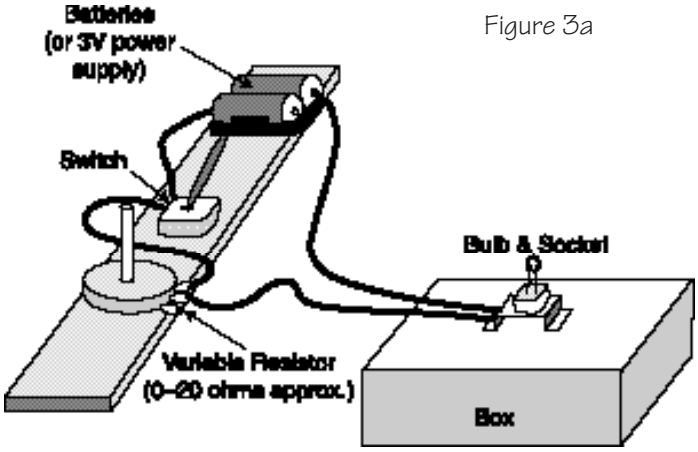


Figure 3a

Version II: A Photocopy Mini-silhouette Projector

This is the same basic idea as the cardboard drum, but in a miniature, one unit version (Figure 3a), particularly suited for a portable planetarium.

There are many ways to do this, but one simple way is essentially the versatile "mini-brute-force" horizon projector described in Interact PASS Astronomy of the Americas, adapted to project the Stonehenge alignments. Assemble the electrical parts as shown in Fig. 3a using a #605 light bulb, a Mini-mag lite® flashlight bulb, a STARLAB main star bulb, or other suitable light bulb with a very small filament as the light source. (The variable resistor is optional.) Photocopy the Stonehenge Mask Assembly (master on page 8) onto a transparency and form the Stonehenge Mask Assembly as follows:


Figure 3b

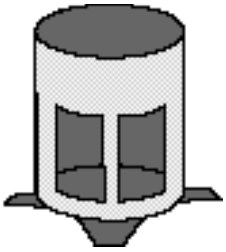


Figure 3c

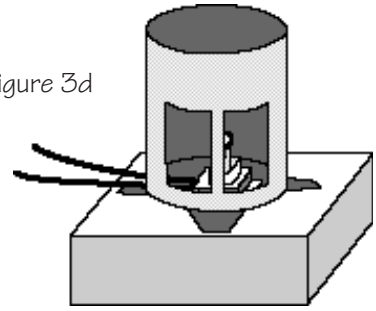


Figure 3d

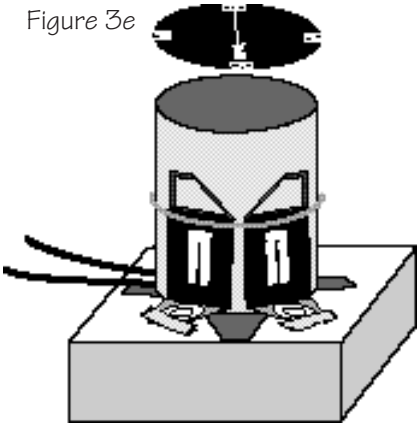


Figure 3e

a. Cut out the six parts of the mask assembly: the Top, the Window Cylinder piece, and the four individual Trilithon Masks. Cut in slits (indicated by the word "cut"). Optional: with a hobby knife or small sharp scissors, cut out the four windows in the Window Cylinder piece. This will make the projected trilithon images brighter and clearer.

b. Fold the "tape" and "handle" tabs as shown in Fig. 3b. There are four on the Window Cylinder, and two on each of the Trilithon Masks. Also fold where indicated on the Top piece.

c. Roll the Window Cylinder piece into a cylinder so that the N, E, S, W, marks read backwards as seen from the outside (frontwards as seen from the viewpoint of the lightbulb; Fig.3c). Tape the seam without covering any windows or letters.

d. Position the Window Cylinder around the light bulb so that the light bulb is centered in the Cylinder. Tape the Cylinder tabs securely to the projector box top. (Fig. 3d.)

e. Lightly tape Trilithon Masks in front of the four clear windows of the Window Cylinder. Put a rubber band around the tops of them. (Fig. 3e.) The top tabs of the Trilithon Masks facilitate adjusting their positions during set-up for the Stonehenge program.

In setting up for the program, the Trilithon Masks need to be lightly taped in place, carefully adjusted so that they accurately mark the solstice sunrises and sunsets, and then taped more securely in place. This works fine, but you must be careful to check the position of the projection masks just before the program to see that all four archways show up in the correct position on the horizon. Moving the masks just a millimeter can throw your alignments off so that the Sun fails to appear in the proper archways.

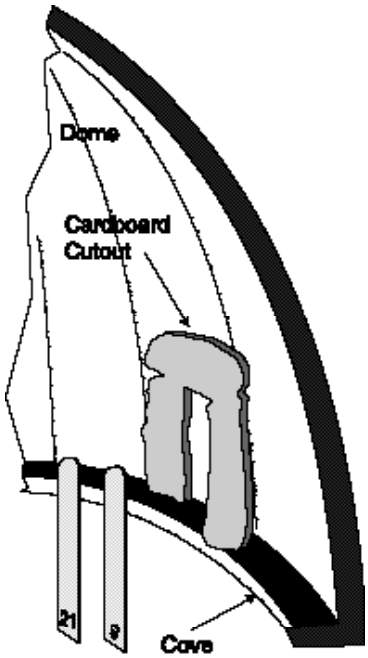


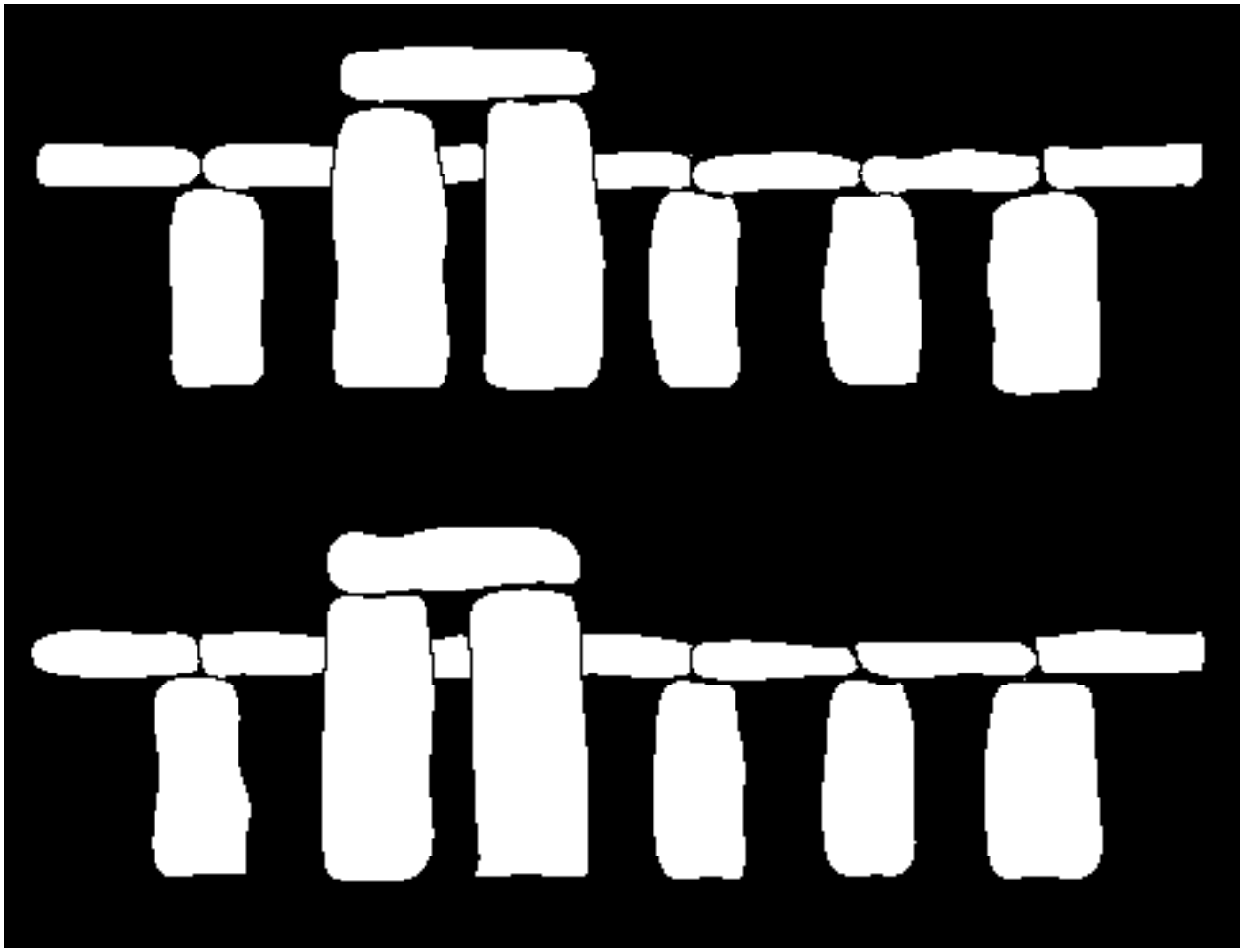
Figure 4

Version III: A Regular Planetarium Horizon Panorama Projection System Showing the Alignment Archways

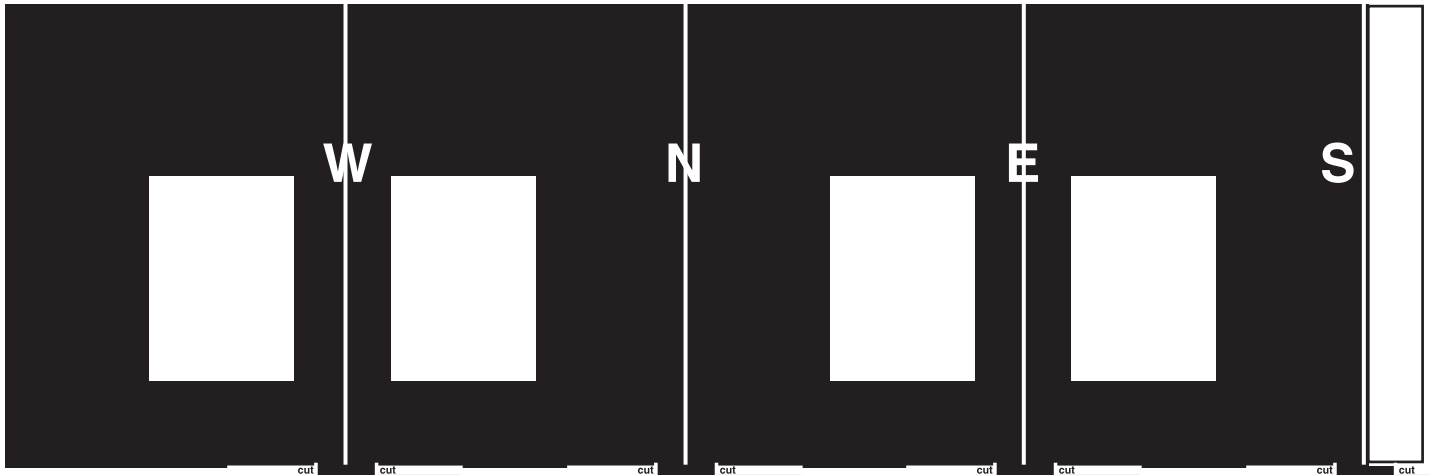
If your planetarium has a horizon projection system, and you can prepare slides for it, you can prepare simple artwork such as shown on page 7 for four archways and adjust the alignment positions as discussed above.

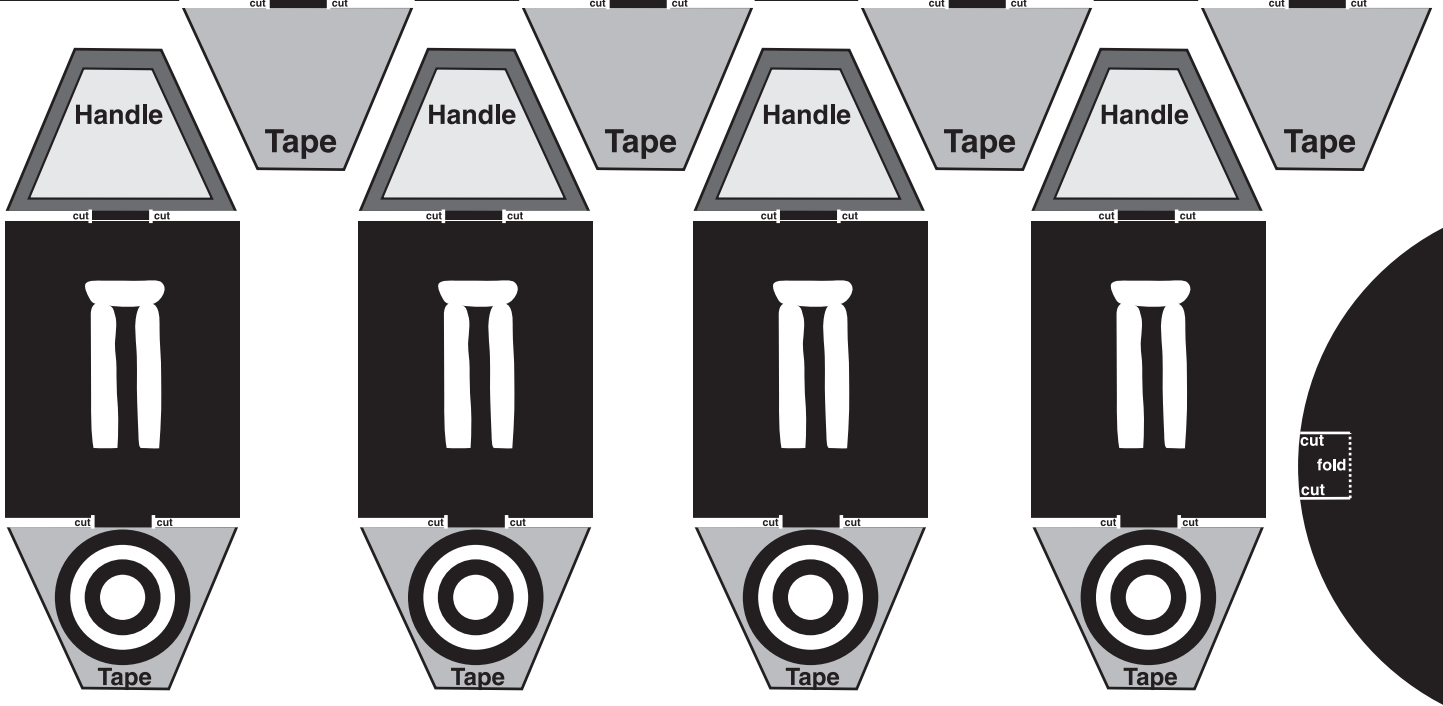
Version IV: Full-size Cardboard Archways to be Attached Directly to the Dome with Tape, Velcro® or Paper Clips (if you have a perforated dome)

A low-tech alternative to the projectors above is to use four large cardboard pieces (Figure 4) attached to the cove. The only major disadvantage to this quick solution is that these alignments cannot be turned on and off with the flip of a switch, so they need to be installed during the program to create the dramatic moment when you compare horizon events discovered by your students with Hawkins' Stonehenge alignments. The installation can be done if you have prepared in advance unobtrusive markers (like pieces of tape or thumbtacks) installed on the bottom of the cove. Students can use those markers to position the cardboard archways quickly.

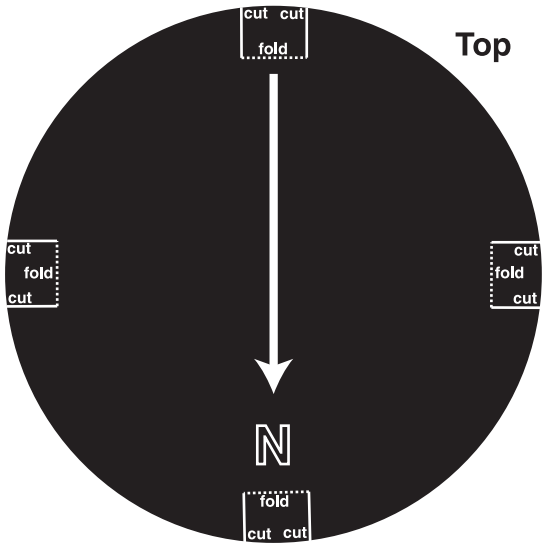


Window Cylinder





Trilithon Masks



Stonehenge Mask Assembly
Master for Photocopy