Paper Plate Education

"Serving the Universe on a Paper Plate"

Activity: Planet Pointer II

This and several other activities from the *Paper Plate Astronomy* videotape and DVD are now available online as **free streaming video**!

Volvelles such as this 15th Century version were designed to aid in the calculation of the locations of the planets throughout the year. The Paper Plate Planet Pointer performs a similar function by indicating the position of the planets in the sky for any given time for mid-latitude observers.

Image courtesy of Chetham's Library, U.K.; used with permission.

The Paper Plate Planet Pointer consists of two plates--a planet positions plate (which must be updated monthly) and a local horizon plate. First, make a plate that indicates the direction of the planets relative to earth, which is centered on the planet positions plate. This can be done in several ways, two of which are illustrated below.


Around the perimeter of a plate, mark 24 hours of right ascension counterclockwise. The center of the plate represents earth.


Plot the positions of the planets and the sun by extending lines outward from the central earth to the right ascension value. The R.A. values can be found under "Planet Summary Data" and at "Sun and Moon data for today" at http://www.heavens-above.com. In the sample images, the visible planets are highlighted with a red circle. Label the lines with planet names or symbols. Extend the sun line to the edge of the plate and draw a sun there.



An alternative method is to draw the earth at the center of the plate in orbit around the sun. *Be sure the earth is centered* and the orbits go around the sun, which is off-center. From the earth, extend lines outward through the planets (in their current orbital positions) toward the perimeter of the plate. Notice that the inferior planets can be in two different positions in their orbit and still yield the same line of sight. Label the lines with planet names or symbols. Again extend the sun line to the edge of the plate and draw a sun there. The resulting lines should be identical to the first method that uses right ascension.



Make a horizon plate as shown. The plate depicts an observer who is facing south, with east being toward her left and west being toward her right. The outer edge of the horizon plate is cut away to allow the sun to be seen on the perimeter.

Place the horizon plate over the planets plate and secure them with a paper fastener. The fastener goes through the center of the horizon plate and through the earth on the planets plate. Your instrument is ready for use.




The sun indicates the time, rotating clockwise once every 24 hours. When the sun is low along the eastern horizon, the time is sunrise (or simply AM). When the sun is high and due south, the time is noon. When the sun is low along the western horizon, the time is sunset (or simply PM). When the sun is opposite the noon position and below the horizon, the time is midnight. When the sun is between those four positions, interpolate for time. This will compensate for some inaccuracies that become amplified near the solstices.

Using the sun as a time indicator, set the sky to an approximate time. Though the sun indicates the time, refrain from referring to the sun as a "clock." Users tend to envision a 12-hour clock face rather than determining the time from the sun's position relative to the local horizon.

Provided the sun is below the horizon, the planets that are visible will be above the horizon in the general direction to which their respective lines point. Note how Mercury is always rising or setting near the sun. The Planet Pointer also indicates which planets are not visible because they are in the daytime sky.



There are limitations to the accuracy of this device, obviously, but

the Paper Plate Planet Pointer gives you a fairly good idea of when to look and in which direction to see each of the planets. A similar device, the Moon Finder allows you to use your local horizon plate and a moon phases plate to determine when and in which direction to look for any given moon phase.

Contributed by Chuck Bueter.

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[Note: This activity is included in the *Paper Plate Astronomy video/DVD/streaming video*.]