Watch - EDT	Sextant
14-36-10	104° 32.4′
37-50	18.2′
39-05	103° 48.0′
40-13	22.2′
41-35	12.6′

Fig. 4 After taking a series of sights, you should have two columns of numbers — time and sextant readings.

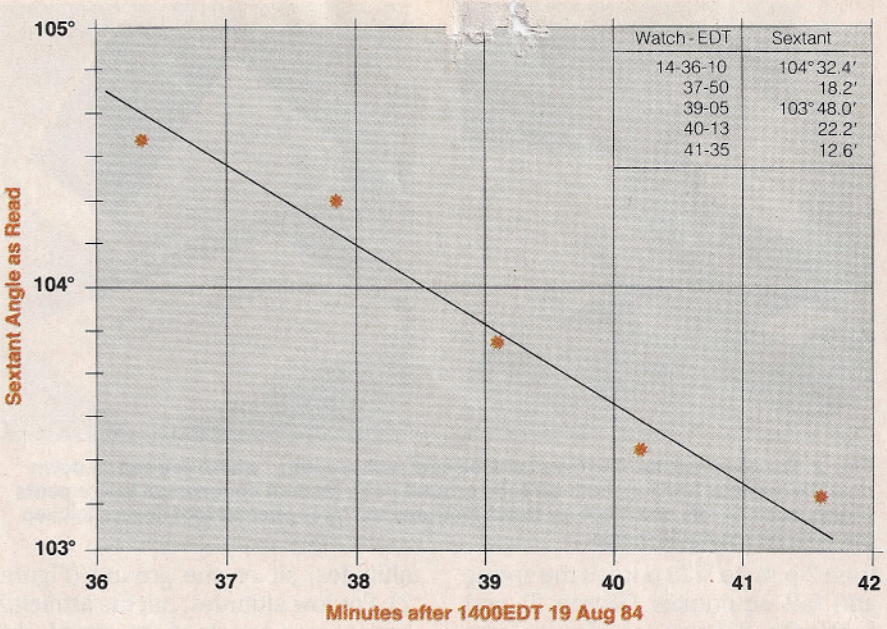
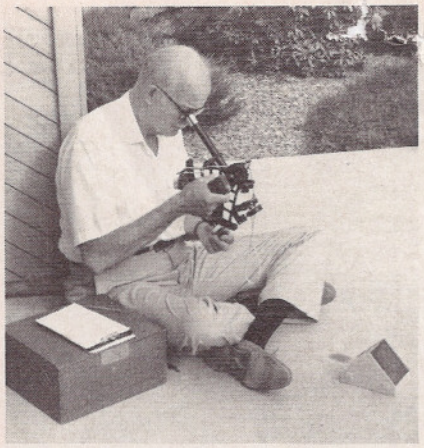


Fig. 5 The numbers from Figure 4 may be plotted on a graph and a line drawn between them to determine if there are large random errrors.

you've captured the two images, bring the *bottom* edge of the image from the index mirror to the *top* edge of the image from the artificial horizon. This is the equivalent of bringing the *lower* limb of the sun to the natural horizon. Always adjust so that you *increase* the angle and do the same when you measure the index error. This will avoid an error due to lost motion.

When you have a good contact, note the time: seconds first, then minutes, then hours, just as you do for any sextant observation. Write this down, then read the sextant angle, decimals of minutes or seconds on the vernier, then minutes, then degrees and write it down. You read seconds of time first to reduce the delay from the actual time of observation. Reading from the smallest to the largest amount also helps you to avoid an error when the minute hand or sextant index is near a graduation. For example, the index might be near 54 minutes. If the vernier reads 0.8, you know the value is 53.8. If it reads 0.2, the value is 54.2 minutes. The same applies to reading the number of degrees from the limb of the sextant. *Many errors come from getting the minutes or degrees wrong and students aren't the only ones who make them.*



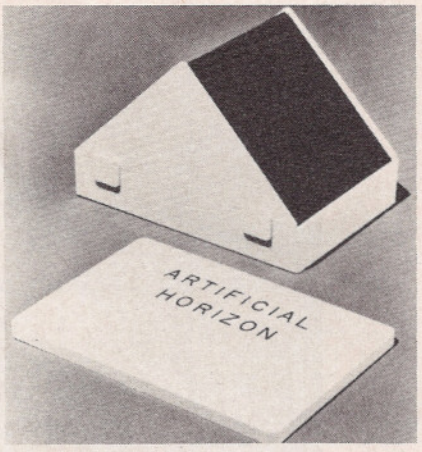


Fig. 2 For good results, find the sheltered spot racing south where you can sit down near the artificial horizon, both on solid ground (left). Modern commerical instruments (right), such as this one made by Davis Instruments, have pitched roof covers to keep the wind off the liquid inside.

from 2 p.m. to 5:20 p.m. At the spring and fall equinoxes (March 21 and September 21), you can observe from 7:40 a.m. to 4:20 p.m. In midwinter (December 21) you can observe from 9:20 a.m. to 2:40 p.m. but you'd better put antifreeze in the water!

You'll need to find a sheltered spot outdoors, facing south of course. You will not get good results through a window because of distortion caused by the glass. For moderate to high altitudes, sit on the ground (Figure 2). For low altitudes, put the artificial horizon on a couple of concrete blocks or something equally solid. The idea is to be close to the instrument because this will make it easier to find the image in the pool. Ordinary tables are not steady enough. Of course, you'll have checked your watch against an accurate time signal, and you'll have pencil and paper handy. If you have more than one telescope for your sextant, start with the lowest powered one.

Index Error Correction

	60.0′
Average of "Off" readings	−23.4′
Angle below zero of scale	36.6′
Average of "On" readings	−30.0′
Difference	+6.6′
½ Difference = Index Correction	+3.3′

Fig. 3 Measure index error frequently. These sample numbers show how the amount of correction is derived from the readings.

When you're in position, place the artificial horizon so that the sun's image is a bit to the right of the center of the pool; it will move to the left as time passes. If you're using an improvised pool of liquid or plain cover glasses, use the densest possible combination of horizon shades.

Now set the sextant at zero, point it at the sun and bring the image down to the reflection in the artificial horizon. This is not as easy as it sounds because you must juggle the sextant to bring both images into view instead of bringing one image to a horizon line. It took me two or three sessions to get this down reasonably well and sometimes I still have trouble. When