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## OBJECT IS BELOW HORIZON

Ken Tapping, 11<sup>th</sup> October, 2016

Anyone who has tried to casually point a telescope at an astronomical object will have found it more difficult than expected. Even something as bright as the Moon will require some “waving around”. However, trying this is a good introduction to the problems that have to be solved to do useful astronomical observations in a reasonable time.

The cure for this is a good, stable, telescope mount. This will make it possible to change the position of the telescope smoothly and positively, and when the object is in centre of the field, to track it as it is carried westwards by the Earth’s rotation. This was achieved in the 19<sup>th</sup> Century.

The other problem is actually finding the object we want to observe. Until very recently this involved techniques like “star hopping”, picking one’s way from one stellar landmark to another, until the desired object is found. The other way is to have position dials on the mount and to have it oriented correctly. Then we can calculate the dial settings, move the telescope to those settings, and with some luck, “there it is”.

Many backyard astronomers still do this, but an increasing number of amateurs are now doing what is done at professional observatories. We leave the finding job to computers. We have catalogues containing the positional and other information on thousands or millions of cosmic objects already in the computer. We tell it what we want to observe and it then calculates where it should be in the sky, and drives the telescope to it. Or, if the thing we want to see has not yet risen, or has recently set, we get a message like “Object is below horizon”. Of course any astronomer worth his or her salt should not make mistakes like that. We should know whether what we want to observe is available in the sky.

Earlier astronomers, like 19<sup>th</sup> Century astronomers William and Caroline Herschel, discoverers of the planet Uranus, had to do it all themselves. They made their telescopes, set them up and did all the observations by eye. Modern observatory

telescopes are not designed for “looking through”. There are imagers, spectrographs, photometers and other instruments available that are far more sensitive and capable than the human eye, and the information collected can be recorded for analysis later, back in the office. The human eye and the observer attached to it are not reliable recorders of information at 3am, especially after many hours of observations, although that is exactly what at least some of our observational ancestors managed to do.

The sophistication and complexity of modern telescopes and other astronomical instruments make them complicated to operate, so doing the driving is usually left to computers and the telescope operator, who is a skilled individual, capable of translating astronomical requirements into observing procedures. Thanks to the Internet and rapid communications, it is becoming less important that the astronomer whose observations are being made be at the telescope at all. The observations can be specified and submitted electronically and a message sent afterwards telling from where the data can be downloaded.

In addition to saving travel money, this makes it possible to operate telescopes more efficiently. The weather and technical problems are hard to predict, and not needing the astronomer to be on-site means the schedule can be easily adjusted, at very short notice to best match the observations to the conditions. In the past a lot of time and money got wasted as astronomers hung around waiting for the weather to change or an instrument to become available. However, observing trips to exotic locations like Hawaii, Chile and the Canary Islands are now increasingly in the past.... Sad.

Reddish Mars and golden Saturn are low in the southwest after dark. Venus lies deep in the sunset glare. The Moon will be Full on the 15<sup>th</sup>.

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