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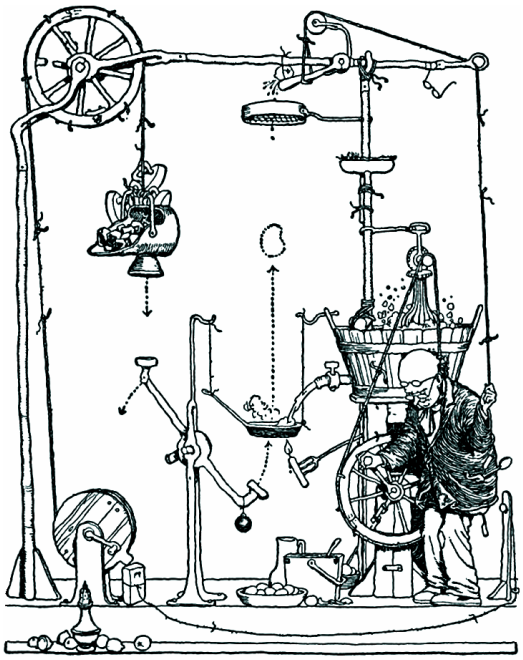
In his *Virginibus Puerisque* (1881), Robert Louis Stevenson writes: '... for to travel hopefully is a better thing than to arrive, and the true success is to labour.' This in turn was based on the Taoist dictum: 'The journey is the reward.' For astronomers, the use of a 'go to' is invaluable for those with experience who have a planned programme; but experienced visual observers, with good knowledge of the sky, can find objects rapidly without a 'go to' and will not so easily become lost. The beginner in particular is susceptible to the mistaken belief that a 'go to' facility is a necessary requirement, but a great deal of enjoyment is lost with the pushing of a few buttons and a glimpse through the eyepiece, when perhaps nothing might be seen. Observing skills are developed by personal exploration and discovery. Here, Graham Relf compares other benefits and disadvantages of 'go to'.



An early 'go to' device

The 'enigma' in the previous *Technical Tips* is the Snow solar telescope, funded by Helen Snow, constructed at Yerkes Observatory, Wisconsin, and established at Mount Wilson, California, in 1904. Professor Roger Griffin alone identified it. For an excellent tour of this observatory, see http://www.youtube.com/watch?v=9Ajws_QkKY0

This issue's challenge (at top right) is to identify at least three of the men seated on the wagon, though there is no need to identify the horses. Clue: there is a connection with the Snow solar telescope.

## Go to or not go to

Graham Relf

I have two regular observing sites, and so I have two equatorial mounts. They are both of the SkyWatcher HEQ5 type, but one is the basic model while the other is the Pro version with 'go to' capability. I am therefore in a position to make a comparison between the two.

I use both with either a 254-mm aperture Newtonian plus DSLR camera or with the camera alone on the mount. I use the equipment almost exclusively for imaging, because that reveals far more than can be seen visually. I use my eyes only for finding my targets, using my Hopper application on a laptop while viewing through a wide 40-mm eyepiece. (Hopper is available for download from the Computing Section website at http://britastro.org/computing/applets.html. For a description, see *Technical Tips* No. 5, 12 July 2012.)

I have been using the basic HEQ5 for more than seven years, but the Pro version was obtained last year. I wanted two mounts so that I need not transport one mount between two locations. My reason for obtaining the Pro model was that I thought I might start using a guiding system, but in reality I have not yet taken that step. I quickly found that I preferred the old mount, and my several reasons for that should become clear from the accompanying table.

Firstly I would note that the tripod is the same for both models. It is quite substantial but portable, especially if the motorised head is separated from it. The legs are easily extendable. At first sight the tripod may seem wobbly, but the key is to really tighten the eyepiece holder rack so that it braces against all three legs. Then the tripod is very rigid and vibration-proof. The tightening has to be done after polar alignment, which can make the alignment/tightening process rather iterative (tightening may affect the alignment).

I believe the 'go to' capability was introduced on equatorial mounts with the aim of making it easier for beginners to find celestial objects. However, the complexities described in the table negate that advantage, in my opinion.

Surprisingly, I have found the Pro mount less accurate in its supposed sidereal driving rate. In taking long sequences of images I have found that the field drifts (after averaging the periodic gear errors) by 24 arcminutes per hour. This results in a significant offset in a 1-minute exposure (significantly greater than the star-image radius caused by atmospheric turbulence). My basic mount has no such drift, though of course both mounts do have periodic errors, which the photographic method has to take into account. It is almost as if the Pro mount requires a guiding system rather than merely making it possible to use one. I have queried this with the suppliers, but have not received an explanation.

In the 1970s the software guru Edsger Dijkstra wrote a famous paper, published under the title 'GOTO statement considered harmful' (because the GOTO statement in BASIC and other programming languages encouraged bad program structure). Whilst I would not go as far as saying that 'go to' mounts are harmful, I cannot see that they help anyone, given the complexity of setting up and using them – though I realise that this statement may be controversial. Give me the basic mount any day.

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| | Basic HEQ5 | HEQ5 Pro |
|---|---|---|
| Motors and controllability | Direct drive. Not suitable for controllers. Silent. (I have read that newer versions have stepper motors, but there seems to be confusion about this.) | Stepper motors. Necessary for control from PC. Some say these motors cause vibrations, but I have not noticed this. They can, however, be heard. |
| Power supply | Runs happily for months on eight D-type batteries. A battery holder and cable were provided, allowing great portability, though a mains power supply can be used if required. | Much greater power needed, requiring use of the mains or a large rechargeable power pack. This makes the mount less portable for me. |
| Drives at power on | Yes. Drives at sidereal rate immediately, which is what I always want for deep-sky, asteroid, and comet photography. | No. It is necessary to go through the start-up procedure (below) and then go down into the menu system to switch on driving. I find this extremely irritating, though there is a choice of sidereal, lunar, or solar rates. |
| 'Go to' ability | No. | Yes, with thousands of objects stored in the hand controller. |
| Hand controller | Simple illuminated buttons for four drive directions. Switches: on/off and N/S hemisphere. | Many buttons for settings and control. In the dark, it is easy to press the wrong button and become very confused. Illumination is activated only after one of the buttons has been pressed, and stays on for only a minute or so. The controller is inevitably complicated to enable the 'go to' capability. |
| Polar alignment | Sighting telescope with useful graticule in RA axis, plus setting circles. Fine-adjustment screws on both axes. Beware if wearing spectacles: the eyepiece end of the sighting telescope has sharp edges that can scratch your lenses (expensive). | Exactly the same as for the basic model. |
| Start-up procecedure | Switch the power on. Could not be simpler. | Multiple steps. If the 'go to' facility is not required, the ENTER key can be pressed about ten times to skip through, but it is then necessary to use the set-up menu to start driving. For alignment on stars, two- or three-star methods can be selected, but with knowledge of the common names of bright stars (not Bayer letters or Flamsteed numbers). With a domed observatory it is particularly awkward because of continually having to move the dome slit. |
| Slewing | The motors cannot be driven at a faster rate. I keep the friction clutches just tight enough that I can easily slew by hand. | The motors have nine speed settings when driven by the keypad on the controller, the fastest of which is a reasonable slewing rate. As I never carry out the start-up alignment procedure I find it simpler to use the slipping clutch method, as on the basic mount; but this must not be done if the alignment and 'go to' capability is to be retained. |
| Meridian flip | No. | I did not know about this until after I bought the mount. If the alignment procedure is utilised the mount flips the telescope through 180º when it reaches the meridian, to avoid the telescope tube hitting the tripod legs. Will it be sufficiently accurate for a photographic sequence to continue? I have not risked it. In any case, this is a flipping nuisance in a dome, because the telescope would no longer be looking through the slit. I consider this another reason for *not* carrying out the alignment set-up. |
| Parking | Not applicable. | The controller enables parking of the telescope at the end of a session, so the alignment procedure should be unnecessary the next time power is switched on. Unfortunately, the parked position has the telescope pointing upwards, making it impossible to lift it safely off the cradle to take it indoors. (I leave the mount in the observatory, but not the telescope, because of dampness/dew.) |
| Periodic gear error correction training | No. | Yes. The manual describes a procedure for recording the errors so that they are corrected at 'run time'. I have not tried it. |