



The 'mystery object' in the previous issue of *Technical Tips* is part of the system of 1.52-m and 26-cm telescopes, working as interferometers, at the Observatoire du Centre d'Etudes et de Recherches Géodynamiques et Astronomiques, located on the Plateau de Calern, near Grasse, in the Alpes-Maritimes department of southern France. Several attempts at identification included a few near misses, but the only person to provide a positive description was Alan Dowdell. Moreover, Alan is familiar with this observatory because he visited it several years ago. This obviously constitutes a distinct advantage – which is why, in fairness, I cannot award him the £10,000 prize.

The current challenge (no prize this time) is, as usual, presented at top right. A clue: goats and elbows, no longer operational.



This screen is much too bright ...

Someone ought to invent something ...

Hopper Graham Relf

This article follows on from my previous article on dark-adapted software (*Technical Tips* No. 3, 20 February 2012), because Hopper is my prime application of the techniques described there. I have used Hopper throughout the observing season recently ended, and it has saved me enormous amounts of time. It has also successfully aided me in avoiding photographing emptiness in cases where the target is simply not visible by eye in my 10-inch f/4.8 Newtonian.

Hopper is a Java desk-top application that will run on any platform that supports Java (Windows, MacOS, Linux, other Unix flavours). It assists in finding faint objects by navigating (star-hopping) from an easily found starting point – typically a naked-eye star. It is designed for use at the telescope by presenting a very dark, mostly red, full screen, and thus the observer's eyes remain dark-adapted for both viewing through the telescope and looking at the computer screen.

When Hopper starts it loads data for 1.05 million stars down to mag. 12 and nearly 8,000 deep-sky objects (the entire Messier and NGC lists), and the data are organised in a special way for real-time speed when plotting on the screen. Hopper first displays its main window, which completely covers the screen and is mainly black, masking the desk-top and all other windows. It then presents a dialogue for setting a target position.

If the coordinates of the target object are known they can be typed into the RA and Dec fields. Any reasonable format can be used (such as sexagesimal with or without unit separators, or decimal hours and degrees), and Hopper will interpret it. If the coordinates are unknown, the name of the object may be typed in the top field and the 'Get data' button clicked. If the object is found in the loaded data its coordinates appear in the RA and Dec fields, in the standard format shown in Figure 1. If the object is not found and the computer is connected to

the Internet, the user will be asked whether to try finding the object online (using Simbad at Strasbourg). If the object is then found, its coordinates are entered in the fields as before, and also the complete response (a VOTABLE) from Simbad is shown in the text area at the bottom, so the user can verify what has been found.

Clicking the 'OK' button closes the dialogue and shows a view similar to what would be seen through a low-power eyepiece on the telescope, with the target object centred. Stars are shown as realistically as possible at their different magnitudes, and deep-sky objects are shown by small red squares. In the example pictured in Figure 2 there are two adjacent NGC objects: 2403 and 2404. The target object has a red cross over it.

This is the main window, covering the whole screen. As the mouse moves over it the nearest star is highlighted with a small red cross (the star below the target in this

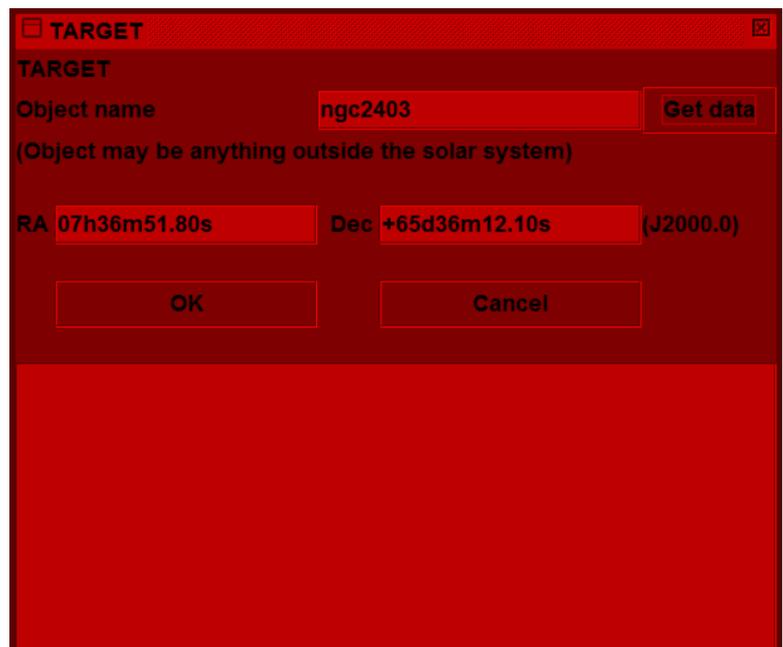


Figure 1

example), and its data are listed in the bottom right-hand corner. Clicking near a star moves it to the centre (but we are not yet ready for that).

The red circle has a radius of 1°. One of the buttons at right toggles between this and a wider 3-degree view (more like a finderscope). The view is rotatable. If you have ever looked through a telescope on an equatorial mount – particularly a Newtonian, where one stands at the side – you will know that it is not obvious which direction is north in the view. So, the buttons at right rotate the view to match the star pattern you really see. There are 30-degree increments, or a half turn. The display can also be flipped to match what is seen with Cassegrain-type telescopes.

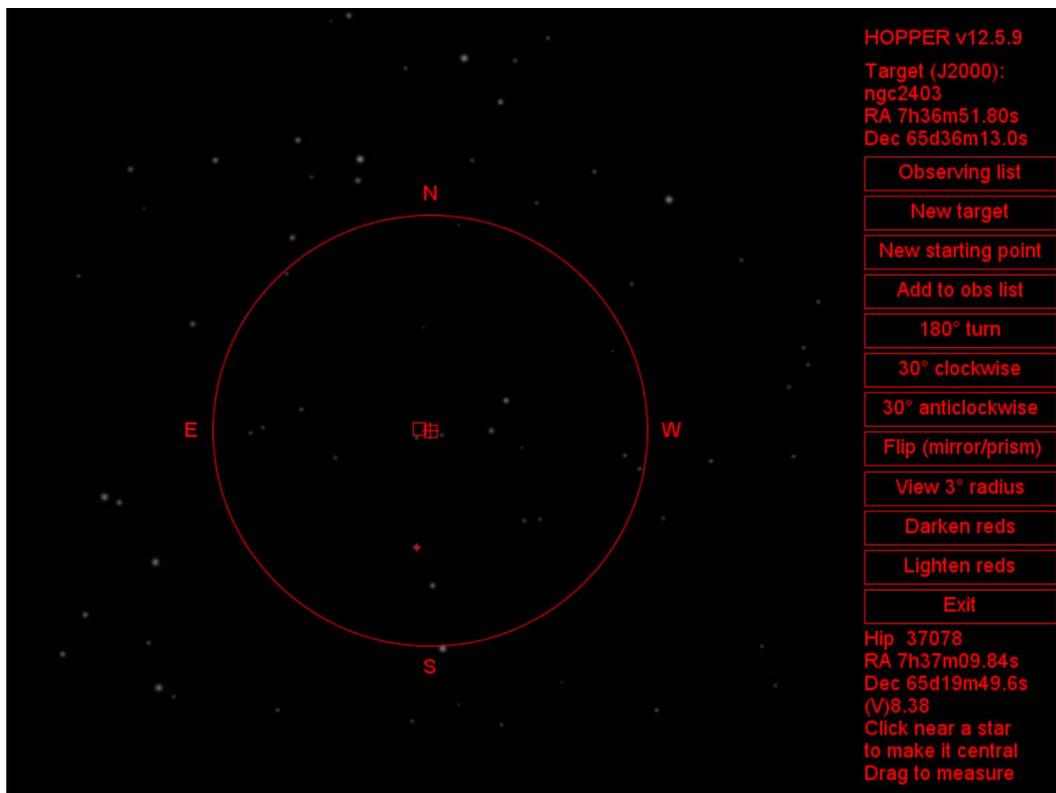


Figure 2

The next important step is to define a starting position – generally a naked-eye star – which is easy to find and only a few degrees from the target. In the example here the target is a galaxy in Camelopardalis, NGC 2403, which is quite a long way from any bright star. (Perhaps that is why this galaxy is rarely seen in photographs, but it is a quite good subject for amateur imaging: see Figure 6 and the link below.) A possible starting star is \omicron (omicron) Ursae Majoris (mag. 3.35). Clicking the 'New starting point' button again produces the position dialogue, this time for a starting point (Figure 3).

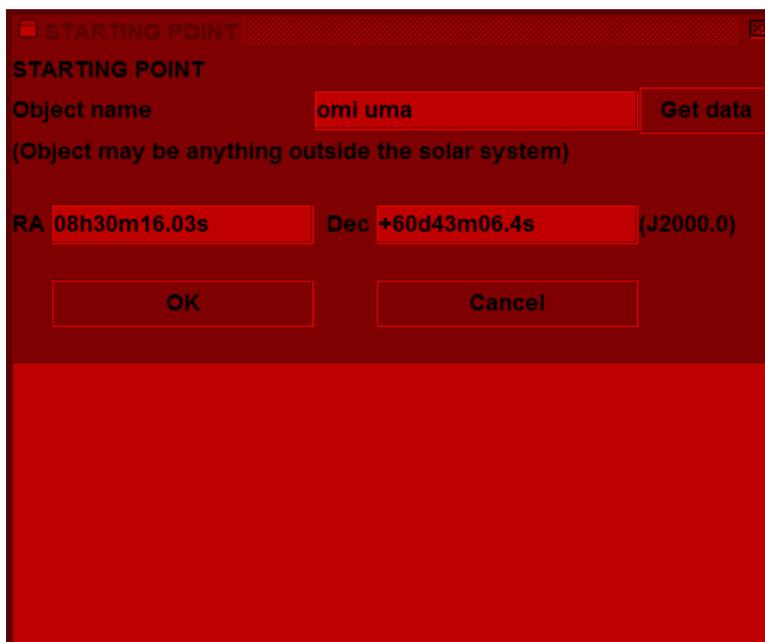


Figure 3

The first three letters of the Bayer (Greek) letter name and the IAU constellation abbreviation are needed to identify the star. Letter case does not matter, so just type 'omi uma' and click 'Get data'. Clicking the 'OK' button then leads to the view from the starting point (Figure 4).

Note that the view has been rotated as described earlier. The starting star is centred, and now there is a line showing the direction to the target. It is 7.7° distant. The observer can then operate the drive controls on the telescope to move the eyepiece view in that direction. While doing that, clicking with the mouse (or touch-pad on a laptop) near a star which has been moved to the centre of the view, brings that star to the centre of Hopper's display, updating the direction and distance indicators. By repeating this it is quite simple to drive the telescope to the target.

The faintest of targets can be lined up for photography by reference to surrounding stars, even if the target cannot be seen at all by eye. I have done this myself many times.

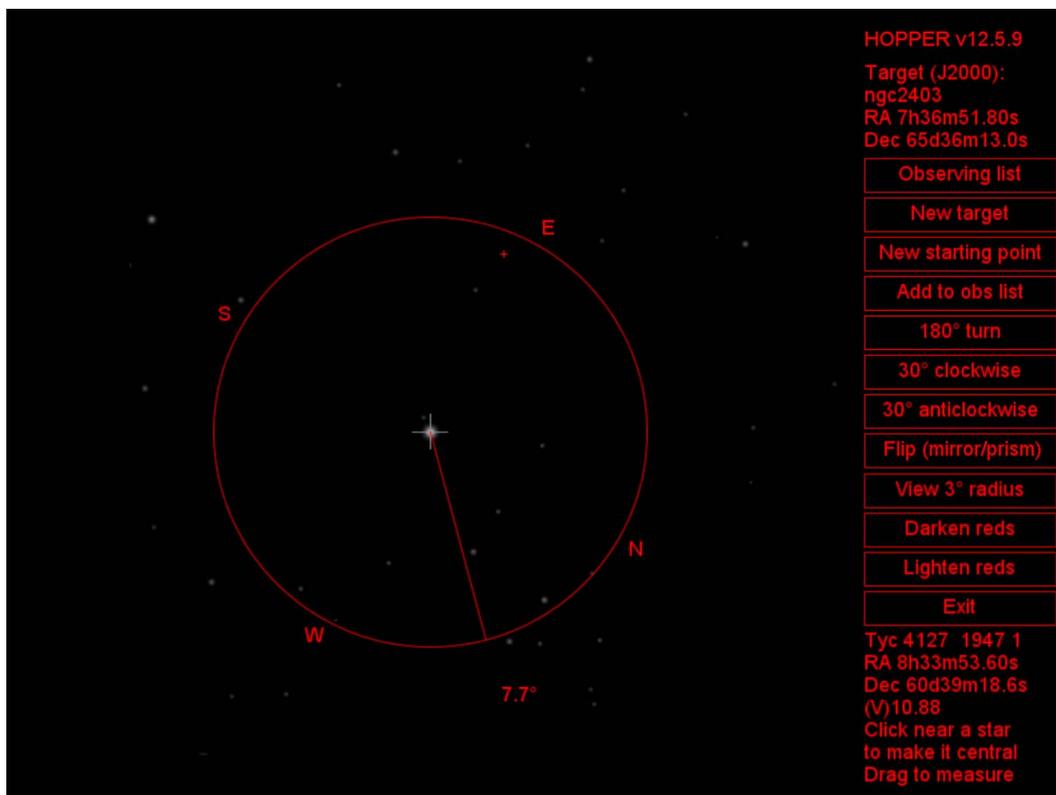


Figure 4

Hopper also has other features: notably, an observing list (Figure 5). This is a table that can be set up before the observing session (or during it, if necessary) and target/starting-point pairs selected from it when required, rather than entering positions during observing time. This list is held on disc as a comma-separated value (CSV) file, so it may, with care, also be edited in a text editor or a spreadsheet. Such applications are, of course, not dark-adapted.

| Target name | Target RA | Target Dec | Start name | Start RA | Start Dec |
|-----------------|--------------|--------------|-------------|--------------|-------------|
| ngc2261 | 6h39m09.50s | 8d44m39.0s | 15 S Mon | 6h40m58.66s | 9d53m44.7s |
| ngc1555 | 4h21m56.70s | 19d32m04.0s | 74 eps Tau | 4h28m36.93s | 19d10m49.9s |
| m78 | 5h46m45.80s | 0d04m45.0s | 50 zet Ori | 5h40m45.52s | -1d56m33.3s |
| Leo II | 11h13m29.20s | 22d09m17.0s | 68 del Leo | 11h14m06.41s | 20d31m26.5s |
| Simeis 147 | 5h40m52.00s | 27d00m20.0s | 112 bet Tau | 5h26m17.50s | 28d36m28.3s |
| RR tau | 5h39m30.52s | 26d22m27.0s | 112 bet Tau | 5h26m17.50s | 28d36m28.3s |
| ngc2346 butt... | 7h09m22.50s | -0d48m24.0s | 22 del Mon | 7h11m51.86s | -0d29m34.0s |
| ngc2371/2 | 7h25m33.80s | 29d29m18.0s | 66 alp Gem | 7h34m36.00s | 31d53m19.1s |
| ngc4790 | 12h54m51.90s | -10d14m52.0s | 40 psi Vir | 12h54m21.17s | -9d32m20.2s |
| Garradd | 9h48m34.03s | 60d36m25.8s | 29 ups UMa | 9h50m59.69s | 59d02m20.8s |

Figure 5



Figure 6. NGC 2403.
2012 January 23, 19:38:34–20:15:01 UT.
Canon EOS 5D MkII, ISO6400, 54 x 32s. 10-inch f/4.8 Newtonian.
HEQ5 equatorial mount, driven but not guided.
Image acquired from Rookhope, County Durham.



Figure 7. Another example: M52 and NGC 7635 (the Bubble nebula).
2012 January 23, 21:20:10–21:49:29 UT.
Canon EOS 5D MkII, ISO6400, 51 x 32s. 10-inch f/4.8 Newtonian.
HEQ5 equatorial mount, driven but not guided.
Image acquired from Rookhope, County Durham.

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Website
Graham Relf at flickr
Hopper: program
Hopper: complete source code

www.grelf.net
<http://www.flickr.com/photos/57296277@N05/6755600807/>
<http://britastro.org/computing/gr/Hopper.zip>
<http://britastro.org/computing/gr/HopperSource.zip>