September 1990

Urania

Astronomical Society of Southern Africa
Pretoria Centre

WHATS UP DOC?

Last month we looked at a few of the objects gracing the Saggitarius milky way region. There are many more in that area but this month I am going to give you a couple of interesting and challanging objects. Mr Van Schalkwyk of Middelburg showed me the error of my ways and pointed out that coordinates for the objects might be useful. My apologies for not giving these before.

How many of you can claim to have seen a planetary nebula. Most of these objects are very small and although relatively bright are difficult to distinguish from stars. A few, however, give good images even in medium sized telescopes. This is a good time of year to observe planetaries as the best of them can now be seen.

The Ring Nebula

This is located in the constallation of Lyra (RA 18:51, Dec +32:58) and is one of the easiest to locate since it lies midway between two fairly bright stars in the field of a finder scope. Note that this is a small object and that you will have to use high magnification which will show a smoke ring of nebulosity. The interesting thing about planetaries is that you are seeing the ghost of a dying star. When stars of a relatively small mass leave the main sequence they become red giants. Toward the end of the red giant phase they become unstable and gently blow off their outer shells leaving behind a tremendously hot white dwarf star which is really the core of the red giant. These stars are too dim to see except with large telescopes but consider when you are looking at the "ghost" that the white dwarf is in the same field. Because the white dwarf is so hot it emits energetic ultra violet radiation which causes the nebula to glow.

The Helix Nebula.

The Helix in Aquarius (RA 22:27 Dec -21:06) is the largest planetary but has a low surface brightness which makes it difficult to see from light polluted areas. Dark adaption is important. Use a low power wide field eyepiece and remember that this planetary is going to fill up between a quarter to a half of your field. Look for a large dim object using averted vision. For

those of you who dont know, averted vision consists of looking toward the side of the field but concentrating on the centre. Your eye is in fact more sensitive to faint light towards the sides of your normal line of sight and this can bring faint objects into view that you would normally miss.

The Saturn Nebula

The Saturn Nebula is also located in Aquarius (RA 21:01 Dec -11:34) and is a small but bright object. Once again use high magnification. The nebula gives the impression of a slightly elliptical planetary disc and in fact has ansae projecting from the side in much the same manner as the rings of Saturn. These ansea are not visable except in very large telescopes.

Once again I invite anybody who wishes to discuss what they have seen to give me a call at 705557.

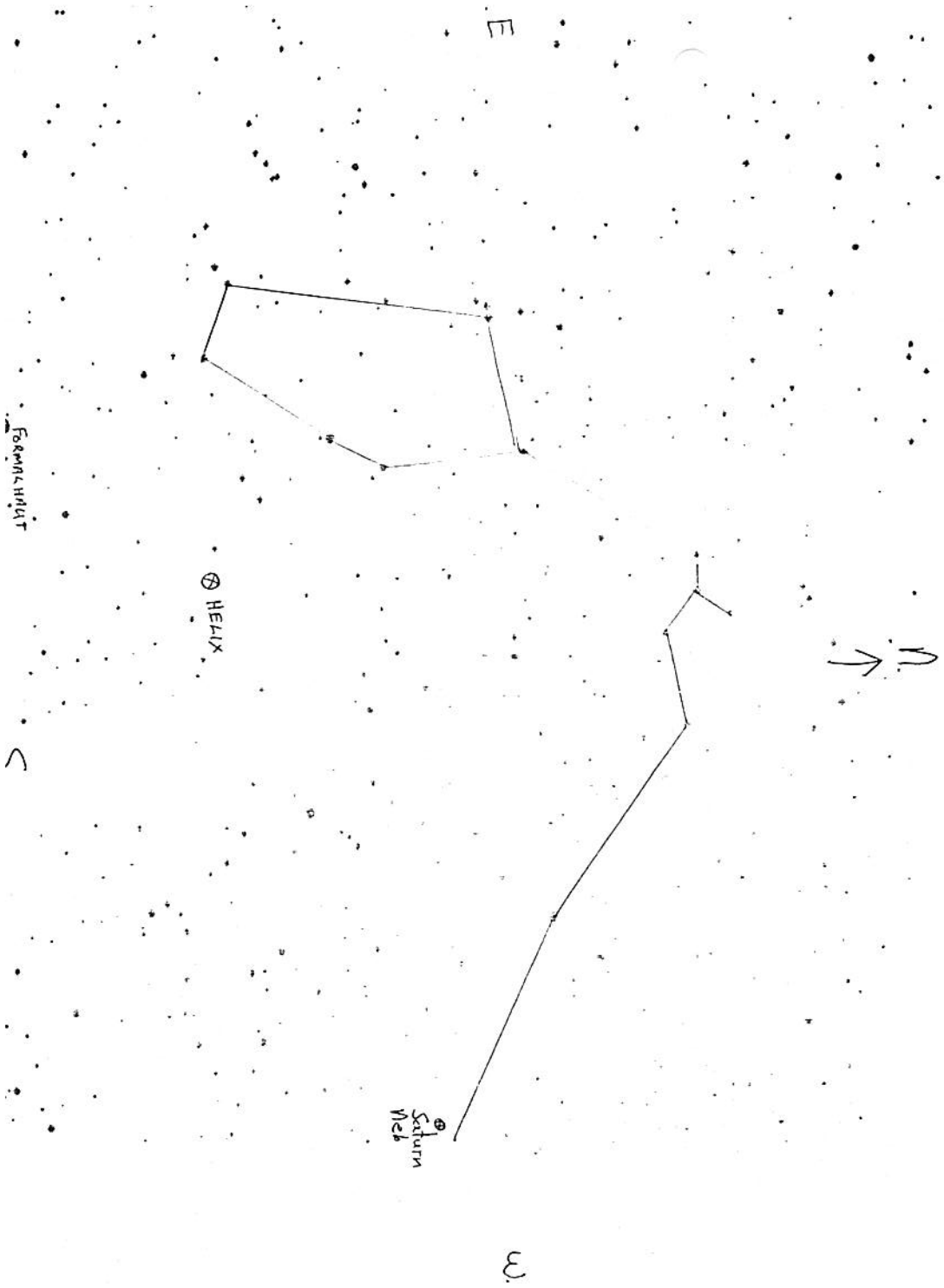
Results of competitions and contributions

I have had a remarkable number of responses to the competitions in the last edition. To be more precise I have had ONE. Neville Robinson seems to be the only one who took up my challange to observe the region in Scorpio and he therefore wins the title of "Most successful observer of the month". Thanks Neville. As far as the competition regarding the main sequence acronym is concerned, I suppose I must be the winner because I had no response at all.

It appears that there are hundreds of you submitting contributions to Urania but that they are all getting lost in the post. Next month Urania will consist only of contributions received. If your monthly magazine therefore consists of only a title, you will have to be satisfied with that. Come on there is a lot of knowledge and experience drifting around in the centre, share some of it.

Astrophotography series

To start off the astrophotography series we might firstly look at some of the advantages of astrophotography as well as some practical applications.
The most obvious advantage is that under good conditions and with sufficient exposure the limiting magnitude of a telescope is photographically higher than the visual magnitude.
This applies not only to stars but can also apply to extended objects such as nebulae and galaxies depending on the focal ratio of the telescope. (If you doe not understand the expression focal ratio do not worry it will be discussed later).
The second advantage is that a relatively objective record of the object being photographed is obtained.
Lastly a photograph provides a permanent record of an event or an object that can easily be shared with others.
Practical applications include-
(a) monitoring variable stars and



under good conditions accuracy to within a tenth of a magnitude can be obtained in this manner;
(b) novae/supernovae searches.

Photographic monitoring of high resolution objects like planets and double stars is usually not practical with telescopes found in amateur hands.

Most of you will probably feel that these articles will not apply to you since you do not have the equipment required. DONT BE NEGATIVE, YOU PROBABLY HAVE THE MINIMUM EQUIPMENT TO DO SOME ASTROPHOTOGRAPHY.

What do you need? A camera with a time exposure is essential. Most of the older 35mm cameras meet this requirement. Some of the more modern cameras do not allow time exposures or use battery power to keep the shutter open. Batteries in these cameras do not like long exposures and you might find your fifteen minute exposure has unexpectedly been only a two minute exposure. Check your camera's manual to determine whether you have a problem in this regard. Cameras usually give better results if they are used with film. But what film? High speed films are available and are ideal to start off with. My experience has indicated that Agfachrome RS1000 colour slide film gives good results although it is quite grainy. The 3M Scotch 1000 ISO colour slide film also gives acceptable results. Slower speed films with finer grain can of course record finer detail but to begin with the high speed films give amazing results with short exposures. As I am still experimenting with different films I will have more to say on this subject in one of the later articles.

You now have your camera and your film and that alone could start you off. With a normal 50mm lens you can take short unguided exposures of up to three minutes provided the camera is held very steady and vibrations are avoided. This implies that some form of stand and a cable release would be nice but not absolutely essential. Such a photograph should provide a reasonably crisp wide angle constellation photograph. Longer exposures can also be tried but at the cost of trailed star images.

For those of you who would like to try photgraphs with longer camera lenses or through the telescope lets take a technical look at the requirements as far as accuracy of tracking is concerned. To start off with lets consider that the finest star images recorded are usually about 0.05mm in diameter. This is not due to the grain of the film but due to diffusion of the image in the emulsion. The ideal situation would then be not to allow the image of a specific star to wander around on the film by more than 0.05mm.

The formula for determining magnification at the prime focus of a lens or telescope is:

$h = af/k$

where
h = size of image at prime focus in mm;
a = angular size of object in seconds of arc;
f = focal length of telescope in mm; and
k = constant = 208000

We can swing this formula around to determine the angular area of sky which would fit onto our

0.05mm spot of film.

The formula then becomes:

a= h*k/f

If we then do not allow the image to drift by more than this angle we will obtain virtually as good an image as can be achieved.
For a 50mm lens (the standard on most 35mm cameras) therefore
a = 0.05*208000/50
a = 208.00 arc seconds or about 3.5 minutes of arc.

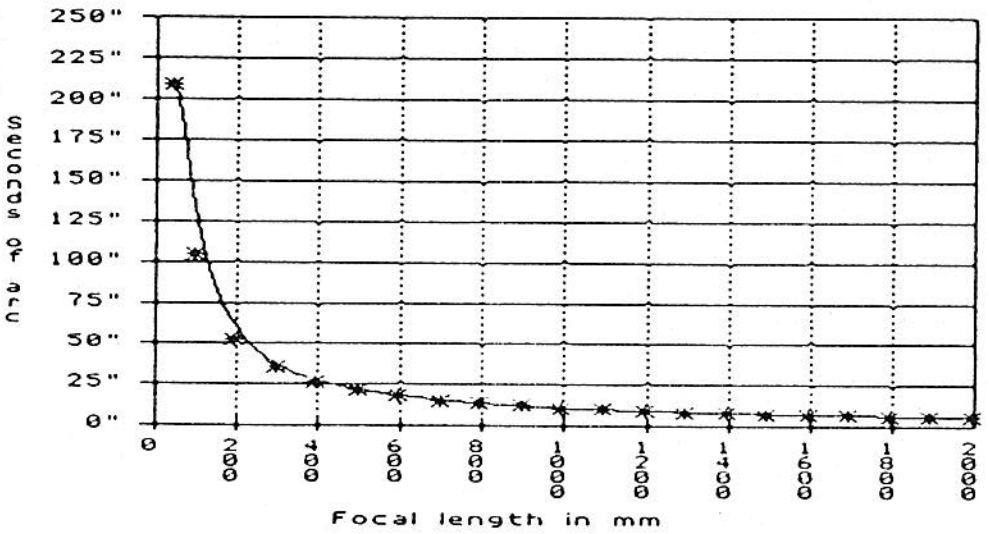
For those who do not feel like doing the calculations themselves I have included a graph which reflects the required guiding accuracy for lenses/telescopes with focal lenghts between 50mm and 2000mm.

allow twice the drift specified and still obtain good results.

Next month we discuss the effect of focal length and rocal ratio.

NOTE: Many of you are already aware that I develop my own colour slide film. This can be done at a small saving over normal costs and gives you the ability to push or pull the film to a higher or lower effective speed. I am prepared to develop film for others who are willing to share the costs of the chemicals. Perhaps if there are enough of us we can buy film and chemicals in bulk and can end up with substantially reduced costs.

ACCURACY NECESSARY FOR TRACKING



This information is based on obtaining the best image possible and in practice you could probably