The PRETORIA CENTRE
of the
Astronomical Society of Southern Africa
www.pretoria-astronomy.co.za

NEWSLETTER JUNE 2005

The next meeting of the Pretoria Centre will take place at Christian Brothers College, Pretoria Road, Silverton, Pretoria

Date and time	Wednesday 22 June (date of the solstice) 19h15
Chairperson	Barbara Cunow
Beginner's Corner	"Beginner's Messier" by Peet van der Walt
What's Up	by Johan Smit

++++++++++ LEG BREAK - Library open ++++++++++++

MAIN TALK

"The South African Large Telescope at SAAO" by Robert Groess from Wits University

The meeting will be followed by tea/coffee and biscuits as usual.
The next social/practical evening will be held on Friday 17 June at the Pretoria Centre Observatory, which is also situated at CBC. Arrive anytime from 18h30 onwards.

INSIDE THIS NEWSLETTER

Last month's meeting - by Neville Young

This was a very well attended meeting with over 70 members, friends and visitors coming along to hear our visiting speaker Prof Ockie de Jager from North West University (prev Potch Univ).

The evening kicked off with Johan Smit sharing his new-found enthusiasm for telescope mirror grinding with us. He has started grinding his mirror at the Joburg Centre on Saturday afternoons and is learning a lot. See the article later in this newsletter.

Michael Poll was left just enough time before the leg-break to point out what we can observe in the month ahead, including Jupiter coming out of retrograde motion and moving closer past the bright star Porrimar on its way back through Virgo.

The main talk by Prof Ockie was a real eye-opener in many ways. We are now aware that fantastic work is being done in South Africa in the field of gamma-ray observing—the best in the world at an observatory in Namibia; that this research has led to spin-offs such as an electronic spark plug; that South Africa is putting it's money where it's mouth is when promoting science and technology. This excellently illustrated talk was a mind-expanding experience!

Last month's observing evening - by Michael Poll & Johan Smit

What an odd evening! On arrival there were gloomy clouds that had rolled in during the afternoon after a week of clear weather. We came with little hope of seeing anything, but then the sky cleared very quickly after about an hour, and we got to observing. The variable stars R Centauri (magnitude 8) and S Carinae (brighter than 5.9) were located, and in passing, theta and eta Carinae, and the cluster near S Carinae (NGC 3114). Then we looked at Saturn and Jupiter. Saturn is disappearing into the sunset, but Jupiter was well up, near Gamma Virginis. Jupiter's satellites were all on one side of the planet, bunched into two pairs. There were two stars in the field as well. The red spot was seen in Michael's 6 inch scope.

After this flurry of activity, it clouded up again about an hour later. We were all packing up at 8.45, when a newcomer, Chris, arrived and, while we were showing him the centre 12 inch and bemoaning the cloud, the clouds rolled away again. The dome was re-opened, and Michael's telescope was taken out of the car and set up again. The clouds did not come back again that evening. We went on a tour of the sky with the two telescopes - Jupiter, the Moon, Alpha Centauri, Omega Centauri, Gamma Virginis (a double star not separated!), M7, M6 and NGC 6231 in Scorpius, and the Jewel Box. Two other newcomers, Denise and her daughter came and they also were keen to see these objects so we did a repeat tour, and we all finished at 10.45 pm.

Sky Guide Africa South

This committee has been too optimistic in the number of Sky Guides we thought would be bought this year. We ordered 150 and still have approximately 80 left over. This does mean a severe dent in our budget. We were too optimistic, but now we are somewhat disappointed.

We have a brilliant idea. Remember that nephew/niece/cousin/aunt/father-in-law who is always such a problem to buy a present for? And particularly when that person has a latent/dormant/potential interest in things scientific or astronomical? The Sky Guide Africa South is a wonderful resource for knowing what is going on up there and settling a friendly astronomical argument. The Sky Guide not only keeps you well informed about the current year, but also contains articles that remain valid for many years.

There is a list of all the constellations and their English names, the brightest stars visible from Southern Africa and an explanation of how stars are named using the Greek alphabet. There are articles on African star lore, basic observing skills, a history of astronomy in SA. There are star charts for all seasons. At the back there is glossary giving the meaning of astronomical terms. Page 58 and 59 contains a clear labeled map of the moon and instructions on how to observe it. Times of sunrise and sunset will not change significantly from year to year, so will be valid for years to come.

Just think how you might be encouraging a young relative to expand into what could be South Africa's next famous comet hunter. That interfering father-in-law could be quieted down by a healthy interest in the night sky. And don't forget the girls - Claire Flanagan runs the Wits Planetarium, Barabara Cunow is our in-house professional astronomer, so there is plenty of astro opportunity for the fairer sex.

We have brought the price down from R50 to R40 to make it easier to buy more than one Sky Guide. No more routine buying of ties, handkerchiefs and chocolates - be original and give them knowledge and a long lasting interest. Rynhardt will have them at each monthly meeting in keen anticipation of your purchase.

Toastmasters

Last year a number of members attended a course on public speaking given by Toastmasters International District 74. The course comprised eight weekly sessions and was held at the Lyttelton Library. The members of the Centre who attended found it of enormous benefit.

The cost for last year's course was R200, of which the Centre sponsored one half. The Centre is prepared to sponsor any other members who would like to do the course, up to a maximum of eight per course. The only thing asked in return is that people use their new-found skills to contribute talks to the Centre meetings.
If any one is interested, please submit names to the secretary, Tony Viljoen, by June 30th 2005. If there is enough interest the Centre will endeavour to arrange another course.

The Days Of The Week - by Michael Poll

The word “planet” comes from a Greek word that means “wandering”. The ancients recognized seven wandering objects in the sky, namely the Sun, the Moon, and the 5 naked eye planets: Mercury Venus, Mars, Jupiter and Saturn. The movements of these objects against the background of fixed stars was measured and recorded in Mesopotamia at least 3 500 years ago. The seven wandering objects are responsible for an arbitrary calendrical period - the seven day week.

The seven day “planet” week comes to us from the Rome, where Sunday was *dies Solis;* Monday *dies Lunae;* Tuesday *dies Martis;* Wednesday *dies Mercurii;* Thursday *dies Jovis;* Friday *dies Veneris;* and Saturday *dies Saturnii*. The celestial identities of the days of the week are evident in the romance languages of Europe i.e. those languages that derive from Latin. For example in French, Tuesday is Mardi, Wednesday is Mercredi, Friday is Vendredi. The “Mardi” in *Mardi gras* is named for Tuesday, and in particular, Shrove Tuesday. (*Gras* means “fat” because people ate a lot before the fasting of Lent).

In English, astronomy can be heard in three of the days of the week - Sunday, (for the Sun) Monday (for the Moon) and Saturday (for Saturn). The names of the other days in English derive from Anglo Saxon words, because when the seven day protocol was introduced into northern Europe by the Romans, some equating of gods was done. Tuesday is *Tiwes Daeg* (Tiw’s day). Tiw derives from Tyr, a Norse god linked with war and leadership. Mars was equated to Tiw because they were both gods of war. The leader of the Norse gods, Odin, was known as Woden to the Anglo Saxons. Woden, was equated with Mercury rather than Jupiter as would be expected, because of Woden’s character of working with good and evil spirits in healing and divining. Wednesday is therefore *Wodnes Daeg*. Thursday was named after Thor, (*Thunres daeg*). Thor was the Norse god of thunder, and his affiliation with storms caused him to be equated with Jupiter. Venus was naturally equated with Odin’s wife, Frig, the Norse goddess of fertility, women and love, and so Friday is *Frig daeg*. Thus some English words for days of the week have their origin in Germanic languages.

Although Rome introduced the seven day week to places within its empire, it did not invent it. The Chaldeans were the first to use it using the Mesopotamian planet gods. Specific gods had been assigned to the planets by the Mesopotamians at least as early as the Akkadian period (2340BC - 2150 BC). The Chaldeans introduced the “seven day week” to the Mediterranean world around 200 BC, and the Greeks themselves equated their own gods to the Babylonian ones in much the same way as the Romans did with the Germanic ones. For example, the Babylonian god of fertility, Ishtar, became Aphrodite in Greece and Venus in Rome.

Although it is easy to equate the “wanderers” to the *name* of a particular

day, the current *sequence* of days at first seems illogical. In Graeco-Roman times, the time taken for a "wanderer" to complete a circuit of the zodiacal constellations was regarded as an indicator of its distance away from the Earth, given that, at the time, it was assumed that all the "wanderers" orbited the Earth. In this scheme, the series begins with Saturn, the slowest to complete a circuit, and goes through Jupiter, Mars, the Sun, Venus, Mercury and the Moon, which should give the days of the week in the order Saturday, Thursday, Tuesday, Sunday, Friday, Wednesday and Monday.

The possible explanation of the current order of the days of the week comes from Greek astrology, wherein each hour of the 24 hours in a day was ruled by one of the seven "wanderers". The cycle began with Saturn, which, because it was the slowest mover, gave its name to the day once regarded as the beginning of the week. Saturn also ruled the first hour of that day, Jupiter would rule the second hour, Mars the third and so on. In cycling through the "planets" through the hours of the day, each of the seven would rule three times in 21 hours. The cycle would start again for the three remaining hours, which would be ruled by Saturn, Jupiter and Mars respectively, thus completing the 24 hours. The first hour of the *second* day would be ruled by the next in order after Mars, which is the Sun, so this day, Sunday, followed Saturday. In the same way during Sunday, after 21 hours the cycle would be complete and the last 3 hours would be ruled by the Sun, Venus and Mercury respectively. The first hour of the third day would be ruled by the Moon, so Monday followed Sunday and so on. Therefore the rule was that the order of the days of the week was determined by which "planet" ruled the first hour of a particular day.

The 24 hour day is an Egyptian concept, so it is thought that the scheme for the order of the days of the week was devised in Alexandria in the second century BC.

Maybe it is fortunate that Uranus Neptune and Pluto had not been discovered at this time, for we may then well have had a ten day week! The alternative view is that if they had been discovered, with the three extra days, we would have enough days in the week to get everything done.

References:

Calendar Worlds E C Krupp
Sky & Telescope January 2001 p 103

NEWSLETTERS BY EMAIL

Some members have indicated on their membership application forms that they want to receive the monthly newsletter by email. Other members who also want to receive it by email, should contact the **membership secretary** of our Centre.

The advantages of receiving it by email is that you receive it sooner than by snail mail, there is little chance of it not arriving, you get all colour pictures in the newsletter in colour, the Centre saves money, and the newsletter editor (who sends out the newsletters) saves work.

A 20 inch Mirror Nears Completion

It may not always appear that much practical activity takes place amongst us, but there is always something going on in the background.

Ever seen a 20 inch mirror? Well, ***Johann Swanepoel*** *has pretty well completed polishing (one of) his 20 inch mirrors and would love for you to see it on the test bench. He has a method of testing which makes use of a video camera and monitor. He has extended an invitation to club members to have a look at the mirror in his workshop in Doringkloof, Centurion. He is very keen to show the results of over a years grinding, so do not feel you will inconvenience him. He has contributed the following article to whet your appetite—Neville*

I have just recently completed the figuring of one of the two 20 inch F4.5 mirrors I am working on using my machine. I have now started figuring the second 20 inch mirror - figuring by machine using a subdiameter tool. The final touching up is done by hand.

I have really learnt a great deal in the the whole process, having made a number of mistakes on the way, e.g. I hopelessly overcorrected the first mirror before starting proper Foucault measurements - relying too much on the Ronchi test in the beginning and not realising how drastic the machine was. I have also gained tremendous respect for the Foucault test, especially when it comes to large deep mirrors. I am using an 8-zone mask with a moving source slitless Foucault tester.

What I have just recently done is to use a small finder scope directly behind the knife edge and attaching a very lightweight webcam to the eyepiece of the finder scope. The webcam I now use is very sensitive in low light conditions and is considerably better than the ordinary webcams that I tried before. This really works well and makes life a lot easier in judging the equal graying of the zone shadows. Any number of people can observe on the computer screen and both video recording and fixed pictures (1.3 megapixel) can be taken. One can also demonstrate and record the effect of air turbulence quite dramatically.

The camera I use is a Logitech® QuickCam® for Notebooks Pro. It has

an an advanced VGA CCD sensor device. Part Number 961240-0914.
Web site: <http://www.logitech.com/> http://www.logitech.com >.
The software allows all sorts of camera parameters to be set - like brightness, contrast, colour, black and white, etc. It also has a digital zoom function. I can also flip the picture horizontally and vertically, which I need to do because the finder scope inverts the picture.

Basically, I have used a short plastic pipe (40 mm long approx) that can slide over the finder scope eyepiece. A piece of elastic band is tied to this short pipe in such a way that I can slide the camera against one end of the pipe and allow it to be held in place by the elastic band against the pipe opening. The assembly is then slid over the eyepiece - allowing me to adjust both the distance longitudinally along the eyepiece and camera rotational orientation - also the exact centering of the camera opening behind the eyepiece.

I have been using Figure XP and Couder as analysis programs to establish the figure parameters obtained. I have just downloaded the opensource analysis software from the site Johan has referred me to and will now be attempting to analyse the figures on that basis -i.e. using the pictures taken at different knife edge settings without having to use a mask. I was again using the setup over the weekend and I must say I am really chuffed at the performance I am getting.

This is an open invitation to you and anybody else out there to come over and have a look at my setup, see the results obtained and give your opinion and helpful criticism. I have already extended an invitation to Chris Stewart of the Johannesburg Centre.

Johann Swanepoel. Cellphone: 082 453 0912 e-mail: johanns@ist.co.za

Sky maps

To generate sky maps for a given place at a given time (and more):
Go to the website with address:

http://fourmilab.ch/yoursky/

Neptune-mass planets around other stars

Until recently, the exoplanets found by astronomers have masses from roughly a few times the mass of Jupiter to roughly a few times ten the mass of Jupiter. (Except for a few earth-mass exoplanets found to be orbiting a pulsar.)
Now, they are starting to discover exoplanets with considerably lower mass - roughly the mass of Neptune. (Mass of Neptune = 17.2 x mass of Earth.) When will earth-mass exoplanets be found?
See Sky & Telescope, November 2004, p. 18.

Amateur Telescope Building- by Johan Smit

Introduction

One of the aspects of our hobby that has been sadly neglected by our centre for the last few years is the art of building your own telescope. This article is the first attempt to rectify this situation. In order to enable our readers to decide whether they should attempt such an adventure, a series of articles will be published on this subject.

The series will cover the steps that you need to go through in order to end up with a functional telescope. Due to the nature of the work involved, the process can be broken up into distinct procedures, each with its own set of rules and, alas, pitfalls for the unwary.

The normal steps are:
1 Deciding what to build
2 Rough grinding the mirror
3 Fine grinding the mirror
4 Polishing the mirror
5 Figuring and testing the mirror
6 Building of the actual telescope

Each , or a combination of of these steps will be covered in the series of articles. You will notice that most of the steps involve making the primary mirror. This is quite natural as it involves the most work and has the greatest effect on the quality of the final product. This specific article will only cover step 1 and pave the way for step 2.

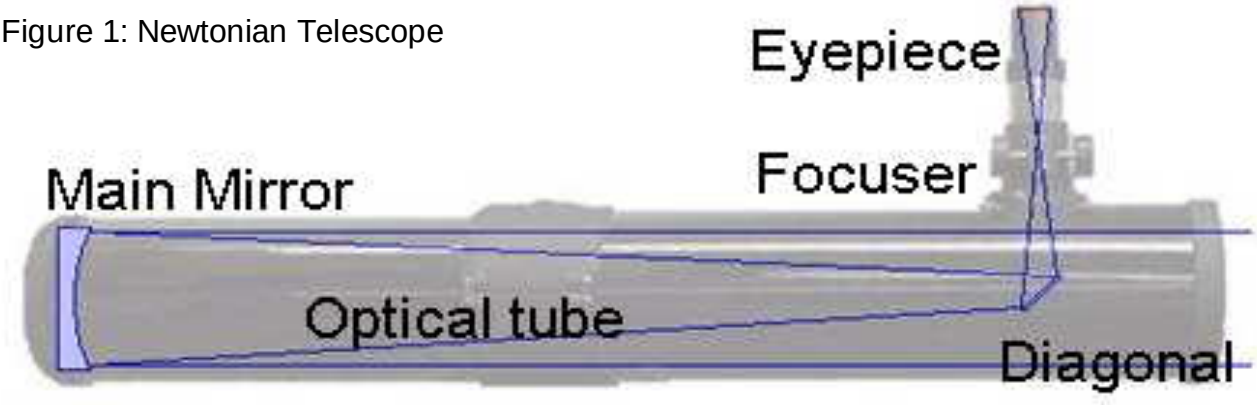
Step 1: So, you have decided that you are destined to build a telescope. The first thing you need to determine is: Am I really ready for such a commitment?

Even though it is possible for any-one, regardless of age, physical strength, mechanical aptitude or financial means to build a telescope, it is an activity that will use up most of your spare time for a considerable period of time.

You will experience many triumphant moments as well as the occasional disappointment along the way. The ratio between these two extreme moments is determined equally by factors within your control as well as external factors over which you have little control. By using simple rules and exercising fairly strict discipline you can ensure that the triumphs far exceed the disappointments.

So, what do you build?
A Newtonian type telescope is the recommended beginner's project. Simplicity of construction and lowest

Figure 1: Newtonian Telescope



cost for the biggest aperture dictates this choice. Therefore these articles, especially building the telescope, will concentrate on this type of telescope.

Figure 1 shows the typical construction of a Newtonian telescope. Believe it or not, all these parts can be made by you with the simplest of tools. However, there is nothing wrong with buying any number of parts and using them in your project. By using your ingenuity and scrounging ability you will be amazed at what items can be used as telescope parts. More about this in episode 6.

What size primary mirror?

The recommended beginners mirror is a 6" (150mm) diameter. This may sound very tiny seeing that everyone has a desire to own a miniature Hubble Telescope.

Be very aware that the amount of work involved in making a mirror goes up exponentially with an increase in diameter. To be fairly sure that you will actually finish your project, it is highly recommended that you start with a 6". You have to learn to crawl before you can walk or run.

Even if you plan to build a larger telescope it is seriously recommended that you first make a small mirror to gain the necessary experience and confidence in your ability. The maximum recommended diameter for a first mirror is an 8" (200mm).

What focal length?

The length of a telescope is determined by the focal ratio (F-ratio). This is typically quoted as f6 or f8. It just means that the focal length is 6 or 8 times the primary mirror diameter. As an example a 6" f8 has a focal length of 6 x 8 = 48" (1200mm).

The focal length determines the absolute minimum length of your telescope's optical tube. You can add a full mirror diameter to your focal length to get an idea of how long your tube will be. Depending on your intended use of the telescope, you will choose an F-ratio that will give you a manageable length.

Generally scopes with a low F-ratio (below f6) are referred to as "fast" and higher F-ratios as "slow". The exact advantages and disadvantages of a particular F-ratio are such a wide and controversial subject that we will not go into the detail in this series. I think I see a follow-up series in the making here.

The only practical rules to consider now are:

1 For a given mirror diameter and eyepiece, a higher magnification will be achieved with a higher F-ratio. Combining a 6"f6 or a 6"f8 primary with a 12mm eyepiece will give 76X and 100X respectively. The f8 will be a better "planetary" scope than the f6.

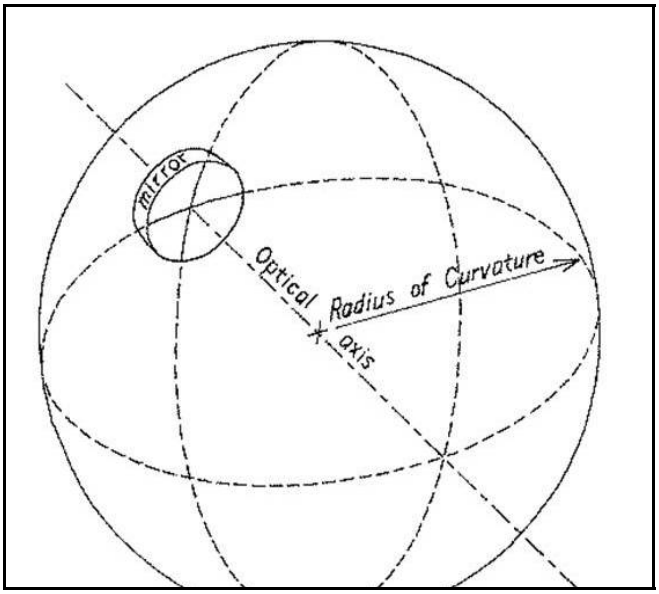
2 It is considerably more difficult to figure a shorter focal length mirror, because it deviates much more from a sphere than a longer one would. Keep your F-ratio as long as possible for your first project.

Recommendation:

Start with a 6" f8 mirror. It will be relatively easy to do, and finish, in a reasonable time. A 6" f8 is also a good general purpose scope that is not too bulky and will give you access to more astronomical objects than you could observe in a lifetime.

How to achieve the desired F-ratio?

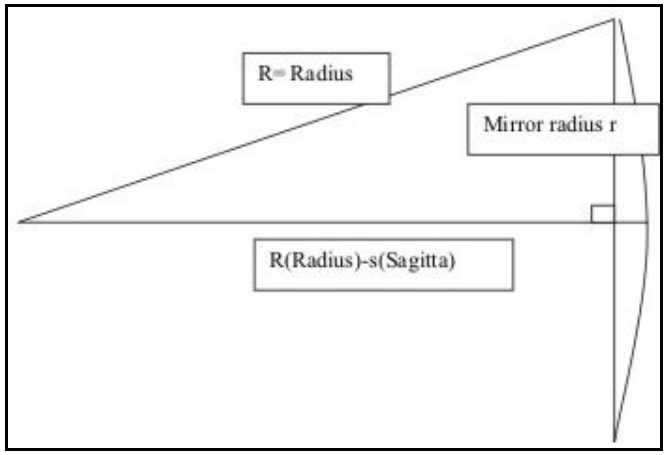
The focal length of a mirror is determined by a curve generated on the face of the mirror that is a small section of a large sphere, or circle.



This large sphere depresses the face of the mirror so that the centre of the mirror is marginally lower than at the edge. The desired focal length is half of the radius of curvature. So, your typical 6" f8 with a focal length of 1200mm has a radius of curvature of 2400mm. With this knowledge you can now "visualise" the physical size of your finished telescope and the shape of the curve on the face of your mirror. I got excited just thinking about my finished project even before I started!!!!

How to achieve the desired sphere?

You need to grind glass away from the face of your mirror until the depth of the curve, also called sagitta, reaches a pre-determined value.



Mathematically it looks like this.

Solving simple formulas will result in:
From Pythagoras' rule
$(R - S)^2 = R^2 - r^2$
Solving for S results in
$S = R - SQRT(R^2 - r^2)$

Or in plain English:
Sagitta = Radius of curvature minus the square root of the difference between the squares of the Radius of curvature and the mirror's radius.

Simplifying the formula further results in: $S = r^2/2R$
This formula is adequate for smaller, longer focal length mirrors, but the exact formula is recommended for large diameter, short focal length mirrors.

OK— Now you know what size your telescope will be and even know what your mirror will look like. So, you get your mirror and tool and grit and start grinding.

How to grind?

For that you will have to wait for episode 2 on rough grinding.

To be continued…..

Fort Schanskop Teleskoopprojek—deur Johann Swanepoel

Die projek bestaan hoofsaaklik uit die volgende drie komponente:

Die teleskoop self.
Die terrein.
Die sterrewag gebou.

Soos meeste seker al weet, het Pierre Lourens verlede jaar 'n redelik volledige stel teleskooponderdele aan die ASSA Pretoriatak geskenk vir die oprigting van 'n nuwe klubteleskoop. Pierre was reeds ver gevorder met die maak en aanmekaarsit van die verskeie onderdele. Daar is 'n voltooide 14.5 duim F5 spieel, oopraam staalbuis, diagonaal skuins-spieel en montering, draai-as stelsel en ander onderdele. Wat nog kortkom is items soos die vurkmontering en die as aanhegtingstelsel na die oop buis.

'n Terrein direk langs Fort Schanskop (op die rand van die parkeerarea) is identifiseer as die mees geskikte een vir die oprigting van die teleskoopfasiliteit. Die terrein by die fort is verskeie kere in die verlede deur die klub gebruik vir openbare besigtigingsfunksies van sterre, planete en komete. Dit is gelee binne die Voortrekker Monument Erfenisterrein en het verskeie voordele:
a) Dit is naby genoeg vir die meeste mense in en om Pretoria om dit gerieflik te bereik.
b) Is gelee binne 'n relatief veilige omgewing.
c) Dit gee redelik onbelemmerde uitsig in meeste rigtings.
d) Is hoog genoeg om die ergste lug- en gepaardgaande ligbesoedeling te ontwyk.
e) Vind aansluiting by toerisme-aktiwiteite na die Erfenisterrein.
f) Dra die goedkeuring en aanmoediging van die bestuur van die Erfenisterrein.

Twee alternatiewe tipes gebou word tans oorweeg, nl.'n ronde koepeldak gebou of 'n langwerpige/vierkantige gebou met 'n afskuif dak. Beide het voor- en nadele.

1) 'n Ronde koepeldak mag miskien mooier vertoon maar dit is redelik kompleks en duur om te vervaardig en sal ook baie langer neem om te voltooi met die hulpbronne tot ons beskikking. As gevolg van die hoogte sal dit ook baie meer sigbaar wees in 'n omgewing waar mense baie sensitief is vir strukture wat bo die bestaande gesigseinder uitstaan en kompeteer met ander strukture op die Erfenisterrein.

2) 'n Langwerpige/vierkantige gebou met 'n afskuif dak sal baie laer wees, minder opsigtelik wees van 'n afstand en hopelik nie probleme veroorsaak met omgewingsbewustes nie. Dit sal goedkoper wees en meer in lyn met die hulpbronne beskikbaar aan die klub. Die hoof nadeel is dat dubbel die grondoppervlakte benodig word om toe te laat vir die afskuifdak. As die mure hoog genoeg gemaak word kan die afskuifdak dien vir motorpakering.
Die subkomitee sal binnekort 'n beslissing maak sodat bouplanne opgestel kan word. Hierdie is die kritiese deel van die projek - sodra ons toegang tot die gebou kan kry kan dele van die teleskoop daar aanmekaargesit word.

Indien iemand meer inligting verlang of graag wil bydra tot die poging kan hulle my of enige van die komiteelede nader.

Johann Swanepoel.

Astrophotography

Photo of comet Linear taken by Mauritz Geyser during last year's star-gazing weekend at Nylsvley Nature Reserve. Photo copied from his website. (See April 2005 newsletter.) Photo taken using Fujichrome Sensia 400 slide film, using a 80/400mm (f5) SkyWatcher telescope mounted on top of a 8" f5 SkyWatcher

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