

A slice of Highlands astronomical life!

Tues 4th August 2009

Introduction

The August 2009 meeting of Highlands Astronomical Society marked the start of a new era. Or at least an era in a new location, anyway! The meeting was our first at the Smithton-Culloden Free Church, and you can read all about it below. As well as the excitement of our new venue, there was also an outstanding talk by Maarten de Vries on the challenges of robotic solar system exploration, and a long list of notices for you to peruse:

- **Membership Application Forms.** It is very important that the Taxpayer box is ticked (if applicable) and the form signed. This ensures that the Society can claim Gift Aid. Also, if the Telephone Alert box is not ticked the member will not be included in the alert system. Got that?
- **Subs.** Subscriptions are due again. It is very important that the Society receives prompt payment in order to fund its ongoing operational commitments. Lapsed members will be required to pay the £2.50 visitor fee from the August meeting onwards.
- **Roll Up, Roll Up!** The raffle continues in its quest to generate useful income for the running of the Society. Donated prizes will be gratefully received.
- **Thanks to Volunteers.** A big Thank-You to all the volunteers that have helped at this year's Highland Games and Black Isle Show stands. These public events depend on the Society's members volunteering and it is much appreciated!
- **Moon-Magic.** Moonwatching For All The Science and Beauty of the Moon, featuring Prof. John Brown and Dr. Gill Russell. Two events will be held to coincide with the Royal Astronomical Society's IYS2009 National Astronomy Autumn Moonwatch Week (phew), which takes place in late October/early November this year, as close to full Moon and first quarter as possible. Activities will include binocular observing, recording phase and position, the effect of moonlight on stars and landscapes, halos and Moonbows, etc. The Highlands Astronomical Society is looking for volunteers to help develop this project. If you are interested, please contact Pat Williams.
- Twitters. In conjunction with many of the most active UK amateur astronomical societies (of which HAS is one), the organisers of IYA 2009 are looking to organise a series of Twitter astro-events over the next few months. Get yourself a free Twitter account and follow us, and other astronomical societies and individuals, at our @HighlandsAstro Twitter account. Does any of this make sense to you? If not, see our Twitter introductory letter on the website now, or speak to Eric he seems to be the Tweeter in charge! http://www.spacegazer.com/index.asp?pageid=169199&msg=Content%20Updated
- Seeing Stars. The latest Seeing Stars article is by Antony McEwan and is all about the oft-overlooked constellation of Ophiuchus and the wonders it contains. You can read it online here: http://www.spacegazer.com/index.asp?pageid=168442

- **New Observing Season.** Next season's observing sessions are nearly upon us, starting with the Society's Open Night on Sat 19th Sept. Please check the website regularly for updates
- **Moon Posters.** Large size Moon-phase posters are still available from Eric for the measly sum of £1 each. Not only do they keep you informed as to the phase of the Moon at any date of the year, but they can also be used as a Sun-shade to allow you to snooze in the garden, or even a swatter to keep flying insects away from your valuable telescopes.
- **Messier Challenge**. Towards the end of the month the nights will be getting darker, so it will be time to fish out the old Messier Challenge sheets again. Now is the time to get your equipment out and start hunting down the earliest Messiers of the season, and who knows if you complete the sheets you may actually get a certificate...
- **Christmas Dinner**. Any suggestions for our mid-December Christmas Dinner will be gratefully received. Please contact Committee members if you have any ideas, as it will soon be time to get the sprouts on.
- **Wigtownshire AS Star Party/Camp.** This will take place from Thu 12th until Wed 18th November at Drumroamin Farm, South Balfern, Kirkinner, DG8 9DB. Visit the society's website for more information or use the email contact for further details. <u>http://www.wigtownshire-astro.org.uk</u> or <u>mailto:info@wigtownshire-astro.org.uk</u>.
- **Committee News.** We would like to thank Donald Noble for all his work on the Committee, especially the role he played in helping to organise and promote the mini Science Festival earlier in the year. His work now means that he has less free time, so he is relinquishing his place on the Committee. This means there is a space to be filled. If you are interested, please contact either Pat Williams or Eric Walker. Thank you, Donald, and we look forward to seeing you around!

Other Updates

A few other things were mentioned by Pat Williams, who led the meeting as Eric Walker was missing,



presumably enjoying himself on holiday. Firstly a vote of thanks to the Venue Working Party, particularly Arthur Milnes, for coming up with such a great venue for our meetings at relatively short notice.

On the topic of the new venue, Pat also pointed out that no tea or coffee cups were allowed in the main presentation area. There is a fully equipped kitchen area and large spaces outside the auditorium, so it would be appreciated if all members could hold to that please.

Members who were present at the meeting were asked to give feedback on the venue when the meeting was drawing to a close. Overall it was very favourable, with only a very few negative points. The heat in the main presentation area (but there are lots of glass windows and it was a very sunny evening following a very warm day), and the fact that sitting in the front row gave one a sore neck when viewing the projection screen. Both these points are easy to overcome, and the huge number of positive points vastly overwhelmed them! The seats are comfortable, the visibility is good, the acoustics are fine, the presentation equipment is excellent, and of course the new venue costs us much less than the Green House did. Also, we have been welcomed with open arms by the owners, and midway through the meeting the church manager popped in just to see if everything was ok for us! Now that's service.

Pat also pointed out that there may be a change to the listed talk for next meeting. It seems there may be a problem getting Martin Hendry here to speak, so there may have to be some schedule shuffling. Whatever the outcome, there will be a meeting and there will be a talk, so worry not!

Personally, I was very impressed by the venue, but not only because of what was inside but also what was outside. When I arrived, there was the best rainbow I have ever seen, arcing right over the building! It was complete and both bows were easily seen. I took the following snap on my mobile phone. One end of the bow was actually located in the church's car park, but as none of us had any shovels (or a JCB) handy we had to leave the legendary golden telescope and eyepieces buried.

The Main Event

'Robotic Exploration – the Challenges' by Maarten de Vries

Maarten has been our interim Chairman and a Society member for about ten years. His interest in the night sky was inspired by the chance viewing of a telescope in a shop window on his way to kindergarten one morning. Having studied Computing, Business Management and Engineering, Maarten found himself up here in the north of Scotland, where he discovered the Highlands Astronomical Society, and promptly joined! Maarten's enthusiasm for astronomy, and also for practical science, is boundless.

Maarten's presentation was about robotic exploration of space, concentrating on one particular aspect. He promised to look a little bit at the history of such work and also to the future, but really to concentrate on the "science and engineering challenges, concepts and considerations when exploring planets and other objects in our solar system".

There followed a series of images that showed what Earth's residents have achieved so far in the way of solar system exploration. For example, the first picture of the far side of the Moon, taken by Luna 3. Also shown was the first picture of the lunar surface taken by something on the surface itself: the Russian lander, Luna 9. Mars 3 was also featured, as it was the first lander to reach the surface of Mars, though it only functioned for 14 seconds. Many others were mentioned too. Looking at the number of images, it is apparent that we have already achieved a lot in the first 52 years of space travel, but it has by no means been easy.

Maarten then began to discuss the reasons that we want to send out these vicarious planetary pioneers. Naturally the foremost reason is the desire for knowledge. As a primary motive, this is fine but the knowledge we seek also includes the availability and location of vital minerals, the possibility of life (past or present) elsewhere in the solar system and the viability of supporting human missions to other planets. Political motivation has been a historical factor in influencing space research, ever since the space-race began in the 1950's and to some extent this motivation still exists. As well as the American goal of revisiting the lunar surface, other nations such as China and India still strive to go there. One of their motives must be simply to prove that they can, and to enjoy some of the economic and political power boost that such an achievement can supply.

So let's imagine we at HAS set ourselves up as an independent state and put forward a goal of launching a lander to visit Mars, for example. We would need to plan the purpose of the mission and outline the goals to be met. We would have to make sure that the equipment necessary to meet those goals was installed on the probe. However, in order to do that, it would have to first be developed and tested, and then built to such a standard that would allow it to work even after the stresses of the launch, a journey of several

months or years, and eventually landing on the target planet. Such equipment would be very expensive to produce and difficult to manufacture.

Having designed the vehicle and got the equipment built and installed, we then have to look at getting the thing to Mars. At the moment the only way of launching a probe is by using a huge liquid-fuelled rocket. Basically the fragile, and very expensive, probe is stuck on top of this giant firework, and then the fuse is lit. If all goes well the fuel ignites, the engines do their job, and after a lot of noise, vibration and thrust have been generated, the thing becomes airborne and proceeds to escape Earth's gravity.

The rocket booster will then be discarded, and the capsule containing the lander will begin its journey to Mars. The journey will have been planned in meticulous detail and will incorporate planetary fly-bys to generate more speed. The complexities of calculating such a route are enormous and if something goes wrong along the way the chances of getting the vehicle back onto the correct route are low.

Having spent several months or years in space, subject to the hazards of intense radiation, impacts from dust particles travelling at combined speeds of thousands of miles per hour, and the risk of mechanical or computer breakdown, there are further problems to face. These are how to slow down, get through the target planet's atmosphere, touch down and then start to achieve mission goals. This stage of the program is known as EDL, or Entry, Descent and Landing. A bit tricky perhaps? Oh yes.

In discussing these problems, Maarten showed a clip entitled "6 minutes of terror". This clip can be easily found on Youtube, and shows how these problems were solved in the recent Spirit and Opportunity lander missions. Imagine decelerating from the interplanetary travel speed of 12,000 miles per hour, to the point where the vehicle drops down from a height of about 20 metres (at a speed of about 54mph) then bounces along on a cushion of airbags until it lies at rest on an alien landscape.

The video can be found at <u>http://www.youtube.com/watch?v=CgUGBVzWnlk</u> and I strongly suggest you take the time to watch it. It really incorporates all the stresses and difficulties that face the development team when their precious lander is millions of miles away and facing possible destruction in the final minutes before actually reaching its destination. The problem is, the procedures that the team develop to get the thing landed have to work perfectly first time. There are no second chances. Even if everything goes well, the airbag-enveloped lander could still land awkwardly, possibly impaling itself on a random pointy Mars rock, which would mean a complete mission failure, even though all the processes up to that stage worked perfectly well!

Having got that far, and assuming that the vehicle deploys perfectly and that the equipment onboard is undamaged, it then has to transmit its findings to mission control on Earth. This can be challenging, and there have been cases where workarounds had to be incorporated at the last minute (relatively). For example, in the Cassini Huygens mission, it was found that the data uplink between Huygens and Cassini would not work, due to the Doppler effect caused by the relative speeds of the two machines. In this case, a solution was found by changing the relative velocities of the two vehicles, so that the Doppler shift was reduced to a level where communication would be maintained between them. The data was then very successfully transmitted back to Earth and the mission was a huge success – but if that one workaround had not been viable the whole mission would have been a very costly and time-consuming failure.

Maarten looked in some detail at the objectives of various landing missions, concentrating in particular on the onboard experiments in the Cassini-Huygens lander. Huygens landed on Saturn's moon, Titan, making it the most remote surface lander so far, and the data received from its transmissions have been very revealing about Titan's nature.

In future missions, we have to consider what the needs are for a mission to be a success. If the lander is required to take samples and conduct experiments on them in situ, it must have the equipment necessary to do so and the ability to transmit the results back to mission control. Also it has to be designed to function in the environment where it will land. At some point in the future, there may be a need to develop a lander with the ability to drill through the ice crust of Europa and explore the subsurface ocean that is believed to exist there. This will present a whole new level of challenges to the design teams! Or what about landers being able to gather surface samples, then blast themselves off the surface and return

with the samples to Earth for examination by human scientists, rather than the perhaps limited onboard analysis experiment systems? Is this possible? It may well be, and it would be great to see this in action someday. I'm sure the designers of future space missions are already thinking about it.

Maarten closed his presentation by introducing Bill Graham, who worked with him at Going Nova, and offering to give a demonstration using a remotely controlled "Mars Rover". This was built as a tool to be taken around schools and used to introduce bright young minds to the concepts of remotely controlling space mission vehicles and the problems with such a task. Several Society members enthusiastically took up his invitation (see below).

Thank you Maarten for another excellent presentation, and one that again not only answered some questions by referring to the past, but also asked many more by looking to the future. We look forward to hearing from you again – perhaps when your first home-built planetary rover is trundling around on a conveniently passing asteroid!

Breakouts!

Continuing the theme of telescope breakout groups, Paul Jenkins showed off his huge 12" f5 GSO (Guan Sheng Optics) Dobsonian reflector supplied by Telescope Service in Germany. A real beauty in metallic emerald green paint, Paul's 12" Dob is quite a showstopper. These 12" f5 'scopes are capable of revealing amazing detail in planetary and deep sky targets, and their optical quality is surprisingly high considering the affordable price tag. A decade ago such a telescope would have been the plaything of only the most serious astronomer with deep pockets indeed, but now these light-buckets are available from many online retailers and offer amazing value for money.

A 2" Crayford focuser allows for very fine and smooth focus control, and the mirror cell capably supports the weight of the huge slab of glass at the back end. Paul's Dob has a built-in fan behind the mirror to speed up the tube-cooling process when he takes it out into the night air, and this means that the views will be steadier sooner than in a fan-less one. Fan-tastic! (Sorry ©)

The other breakout featured Bill Graham and Maarten de Vries and their home built Mars Rover. Not exactly in the same league as Spirit or Opportunity, this little rover was much cheaper (about £200) to build and didn't have to endure the stresses of interplanetary flight. However, and perhaps nearly as tough, it does have to endure repeated and prolonged exposure to large groups of schoolchildren. It is used as a tool to develop children's interest in science, and as Bill is one of the organisers of the Going Nova events, he is in the perfect position to make the most of ideas such as this.

The rover is equipped with an onboard camera, which transmits its view to a projector. The view is then projected onto the wall or a screen, and children (or even astronomical Society members) can take turns at controlling the rover. The trick is though, to only use the projected view from the camera to steer by, not your actual view of the rover! This shows in a small way one of the problems in controlling real life rovers over the vast distances of interplanetary space. You cannot simply look out the window and see which way the rover is pointing, then do a real-time manoeuvre – instead you have to depend on the view as seen from the onboard camera and react accordingly. All this, and take into account the time-lapse inherent in the task due to the huge distance separating the vehicle and its controllers!

We all had a go, and used the onboard hi-tech specialist measuring tool (ruler) to measure various "space-rocks" and even an unfortunate alien I happened to run over. Hey, if you're going to measure aliens it's best to run them over first – that's what I always say!

It was a very enjoyable hands-on experience and showed in a real way one of the problems of controlling a vehicle remotely over a large distance.

<u>Next Time</u>

The next meeting will take place on Tuesday 1st Sept at our new venue, the Smithton-Culloden Free Church on Murray Road, Smithton. It will start at 19:30, with the Youngstars children's group starting at 19:00. There will be a talk, and it might even be Martin Hendry's one on 'Captain Cook and the Cosmic Yardstick' if all goes as planned. There will be breakout groups too, and the fruits of the church's wonderful kitchen to enjoy.

In the meantime, enjoy the rest of August and spend some time getting your equipment ready for the coming dark nights!

See you in September,

<u>Antony</u>