

# Reflections

Journal of the Northern Sydney Astronomical Society Inc.

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Welcome to the first electronic issue of Reflections.

All members having access to internet it was decided that Reflections would no longer be issued in print.

This presents 2 advantages:

Firstly for the Society, we'll save on the printing and mailing expenses.

Secondly, for me, I won't have to stick to the 8-page format you have been accustomed to. I'll be able to modulate the number of pages according to the contributions I receive.

Obviously I won't publish any issue that comes under let's say 4 pages, so keep the

articles coming, but I hope this flexibility will prevent the repeat of what happened to the October 2013 issue, namely... no publication!

Anyway, whatever the format remember that Reflections is your magazine and all members can contribute: articles, reports, events, photos, news... anything you think may be of interest to other members is welcome; I'm eagerly expecting your contributions and suggestions.

Cheerio,

*Jean-Luc Gaubicher*

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## President's Message

Hello all Members,  
Hopefully all have successfully survived the Christmas and New Year festivities, including the well attended NSAS Christmas Party, where we were all driven to excess by the abundance of food brought along by our coterie.

It was delightful to see the mix on the night, with many of our long service members joining with newer members to share experiences, tall stories and astronomical theories not yet released to a waiting world. Yes, here at NSAS we are the incubator of radical thought, experimentation and discovery.

In order to foster and encourage this scientific activity, we will be arranging additional social functions, starting with an early year BBQ at the College in March, date to be arranged so watch this space and keep all of March (especially early in the month) available in your diary, so as to be sure not to miss out.

Further, the new, improved New Astronomers program will be on again and will be well worth following, even for the experienced members who will be able to contribute on the nights.

Saturday Observations are going strongly and we will be looking to work on this

event as it is seen as being a strength of NSAS, serving the interests of both regular observers and those who are totally new to the field and just want to have a look through a telescope, perhaps for the first time.

That telescope may well be the club's own scope as Tim will now be taking it along to Observations. So, you don't need to own a telescope to attend.

Building on our strengths, in fact, will be one of our aims during the year.

We have been going for quite a long time now but I think we may not have fully come to grips with exactly what we are trying to achieve and how to go about it.

It's a moving target, I guess, and perhaps we simply need to reassess each year according to the circumstances of the day.

On the subject of building on our strengths, we have had a very strong theory faction amongst us over the years but it has gone a bit flat over the last twelve months or so, to the point where it is currently in recess.

At the Christmas Party a few interesting thoughts came up which we should explore further on.

It basically involves a similar principle to what we have been applying in other areas: somebody puts their hand up to simply do some coordination and spread the load.

More on this later, but please remember you

may not even need to directly contribute on the night, you might just coordinate.

Please note we also need a Secretary: think about helping out. The Committee members will all help you and you won't be left on your own.

The job involves mainly the preparation of the meeting minutes, watching over the web site correspondence and referring the matter on to the appropriate member.

And so you get to spend time dealing with really interesting committee matters!

Speak with me or any Committee member.

Also, some things to think on:

- What could / should we spend the \$250 pa library allocation on?
- Do you have any quality material you could donate to the library?
- Please pay your annual fees if it has not been dealt with.
- All observers, please ensure you have arranged your laser pointer cover.
- Watch out for the Linden (in the mountains) observations visit(s) this year .

Looking forward to another good year,

*Bruce Retallick*  
President

# Calendar

**General Meetings:** February 18<sup>th</sup> Speaker: TBA  
March 18<sup>th</sup> Speaker: TBA

**Observing Nights:** Consult NSAS' web site at <http://nsas.org.au/observing/>

**Deadline:** Please send your contributions to the April issue of Reflections in time to reach the editor **before March 15<sup>th</sup>** to [nsas.editor@ozemail.com.au](mailto:nsas.editor@ozemail.com.au)

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## Dr. Brian Schmidt @ NSAS

Last July we had the privilege of listening to the Nobel Prize in Physics (2011), Dr Brian Schmidt, talking about the study of the "First Stars in the Universe".

With incredible simplicity he explained to the audience the challenges of this kind of studies, the technology available, the results and how to interpret the data.

We even had the chance to have unveiled unpublished material about his own work!

Then we got to know a bit more about the human being behind the scientist and his passion for wine and pizza.

In my opinion, it was not the Nobel Prize in his resume that made this night one of the best, but the quality of the talk, designed to deliver knowledge and meaning, and all the motivation I took home with me that night.

*Irene Justiniano*

*Dr. Brian Schmidt discussing some finer point of his presentation with Bob Fuller*

*Photo by the Author*



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## Cryogenics - A stepping stone to the stars?

Have you ever looked up at a star and wondered if we could go and visit it? This may not be as far-fetched as they sound.

Currently, we have the technology to go and visit the stars. We can do that with existing technology, such as chemical rockets, ion drives, space based nuclear reactors and using gravity assist from the outer planets (specifically Jupiter). However, the trip time is of the order of tens of thousands of years.

Various methods of travelling quicker to the stars have been proposed. Some of these are theoretically impossible, at least with our current understanding. These includes warp, faster than light, drives and using worm-holes or black holes to warp space and/or time.

Others may be theoretically possible but are likely to remain out of scope of our engineering capability. These would include hydrogen RAM drives where a ship collects hydrogen from the inter-stellar medium, puts it through a fusion reactor and uses the produced energy to propel the ship forward and anti-matter drives where matter and anti-matter are combined to produce thrust. Even fusion

reactors, which we have billions of dollars developing, are still outside our grasp.

One capability that would make inter-stellar travel an option with current technology is cryogenics. This would allow us to freeze an astronaut at the start of a trip, send him (or her) on their way and then revive them (several thousand years later) at the completion of their journey. Such a capability has already been proposed in movies such as Aliens and TV series such as Red Dwarf and Dr Who.

Being able to freeze astronauts has a lot of benefits. You don't have to worry about heating the spacecraft or re-cycling air and water. Think of all the food you would save. Also, you avoid the problem of astronauts getting bored or depressed or developing mental problems such as worrying about having left the iron on back on Earth and face an astronomical electricity bill when they return.

We know that some seeds can survive being frozen for a long time. Also, some animals, such as the New Zealand weta, a type of cricket, can survive being frozen for a short period of time. We can use these creatures to study how they cope with freezing.

Unfortunately, current freezing techniques do not work as the damage inflicted to a cell structures by the expansion of water when frozen and the formation of ice crystals is severe. So the people who have currently paid to have their bodies frozen after death in liquid nitrogen don't stand much of a chance of ever being revived. However, we have managed to successfully freeze human embryos as part of IVF; we just need to develop techniques for freezing other human cell types.



*Picture from Dr. Who A Christmas Carol*

Reality check: Even if we perfected cryogenics, there would still be huge challenges with inter-stellar travel. We would still need to protect the frozen astronauts from cosmic ray damage during the flight but reviving them periodically during the flight to allow their normal DNA repair mechanisms to fix some of the damage before it gets too great might help.

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*David Wallace*

# NSAS Field Trip to Kuringai NP

On Saturday October 19<sup>th</sup>, more than 20 NSAS members met at Elvina Track, Kuringai National Park near West Head for a guided look at Aboriginal rock art sites.

Duane Hamacher, a lecturer from University of New South Wales, and a previous speaker on Aboriginal astronomy to the Society, had kindly agreed to lead the tour.

The large rock platform at Elvina Track has over 100 individual engravings, and like the rest of the engravings at Kuringai NP, they are believed to have been done by the Guringai people, who lived on the north side of Sydney pre-European contact. This site is not marked, to reduce traffic and damage.



*At Elvina Track rock platform*

We discovered the famous engraved emu which is believed to be a mirror of the Emu in the Sky, as well as engravings of many cultural heroes like Daramulan, objects such as shields and many animals, including whales.

We next went to the Basin Track, where



*Duane Hamacher discussing the engravings*

National Parks and Wildlife have made an extensive display of engravings with informative signage, as well as a boardwalk to avoid damaging traffic.

At this site is the equally famous “man and woman under an eclipse/boomerang” engraving.

Because some Aboriginal language groups said the Sun was female and the Moon was male, there is speculation that the male and female forms under what could be an eclipse confirmed the belief that the Sun woman was making love to the Moon man.

Unfortunately, there is no passed on knowledge from the Guringai people to confirm this

After lunch at Commodore Heights (West Head), the remaining group walked down the America Bay Track and Duane bush-bashed us to a rock platform he had seen some years earlier.

This had some quite enigmatic rock art, including a large figure which could be a kangaroo.

Everyone making it to the tour expressed their interest in the very well preserved engravings, even though there was some evidence of misguided attempts to highlight the engravings with chalk in some places.

Images of the strange “kangaroo” have been sent to Hugh Cairns, a specialist in Sydney engravings for comment.

*Bob Fuller*

*Photos of the trip by the Author*



*The walking was pretty easy*



*Lunch at Commodore Heights (Barrenjoey Head in view)*



*The Emu in the Sky and emu engraving at Elvina Track  
Picture credit: Barnaby Norris*

# NSAS Spotlight

In this edition of Reflections I'm starting a regular space to get to know our members.

My first guest is Robert (Bob) Fuller, who was awarded with a Life Time Membership at the past Annual General Meeting.

**IJ** How did you develop your interest in Astronomy?

**BF** I was reading cosmology books from around my 40's, and would have probably just stuck to this until I joined NSAS and developed my interest a bit more broadly.

I had only a semi-scientific education (anthropology) and, because of poor maths, I never was able to get into a pure science stream in my education.

**IJ** What did inspire you to get into astrophotography and what has been your biggest challenge in this area?

**BF** When I joined NSAS there were a number of members playing around with entry-level astrophotography, mainly the Cookbook cameras, due to their skills in electronics.

This was over my head, but when the early digital cameras (point and shoot) like the Coolpix came along, I started investigating this very frustration entry to astrophotography. I guess I wanted to take pictures like in the magazines, never happened!

Later I splurged on a modified DSLR, and as we were settled where we are living, put up a small shed and my LX200 in it. A couple of then-members, Peter Phillips and Ray Jones, were very active in this type of astrophotography and helped me to get through the early problems of setup and learning the process. We also exchanged our work by email.

**IJ** What did motivate you to investigate the view of the sky from Aboriginal Australians? Has the acquirement of this knowledge impacted your life in any way?

**BF** I was getting close to retirement, and either Duane Hamacher or Ray Norris first came to NSAS to speak about the Project.

We got to talking, and they picked up

on my education in anthropology (and interest in astronomy) and suggested I could do some research for them when I retired, which I did and wrote my first paper, which is only now just getting published.

From there, Ray talked me into doing an MPhil at Macquarie Uni, following in Duane's footsteps, so to speak, and I'm coming up on halfway through that process.

The opportunity to meet very interesting people, look at Indigenous culture through a new direction, and learn new academic skills has been a very exciting process and has turned what might have



been a search for things to do in my retirement into something I can continue doing until I'm too feeble.

I've also enjoyed bringing this knowledge to the Australian public and, in a small way, meeting an obvious need for whitefellas to hear interesting and good things about Indigenous culture, not just the bad things.

**IJ** How did you get involved with NSAS and how would you describe your experience during your journey along NSAS?

**BF** I can't remember how I first heard about NSAS, but I joined mainly for the cosmology interest, and the speakers.

I tried some of the then Theory Group, but it was totally over my head (there were a lot of very technically smart people in NSAS 10 years or so ago). I eventually got talked into observing, bought a cheap, used scope, and started the process of more and more sophisticated astronomy.

I was working during this time and travelled a lot, so my involvement was a bit limited, but later I joined the Committee, eventually becoming President for 3 years.

I, like a lot of the other older members, weathered the bad period when we had a "problem" Committee and became more active when Ron Washington sorted out the Society after that.

Since stepping down from the Committee in 2011, I've used my contacts in the astrophysics and university profession to help with getting speakers and helped out with trying to get new members through the NAG and field trips.

**IJ** As an important contributor, you have given a lot for the Society. Do you feel that you have received anything in return?

**BF** Of course.

I owe my interest, and much of my knowledge, about astronomy to the Society, through Theory Groups, speakers and general involvement with other members. In particular, I doubt whether I would have ever had the contacts which lead to my getting into academia after 40-some years, and resulting in almost a new career!

Societies like NSAS generally reward one in proportion to the amount of effort one makes to support the Society, and I feel well-rewarded.

Thanks for your passion, Bob. You've become yourself an inspiration for others.



*Irene Justiniano*



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# What Makes Venus So Bright?

The last couple of times while observing the early evening sky during NSAS's outreach activities, we have trained our telescopes on Venus, and the question always arises: what makes Venus so bright?

Our simple answer, that Venus is shrouded in thick cloud and sunlight bounces off these clouds making Venus appear very bright, satisfies most viewers.

Looking at the sky this month (December 2013) Venus looks particularly bright. Why is that?

My research shows that the simple answer is not the entire story. The phases of Venus and its path around the Sun have a lot to do with its brightness.

If we had watched Venus over the last few months we would have noticed that the planet appeared full and small when it was on the opposite side of the Sun from Earth, at Superior Conjunction.

As it moves around the Sun and closer to Earth, the angle of sunlight changes and the planet appears to us to be getting brighter. When the planet is between the Earth and the Sun (Inferior Conjunction) it appears to us as a thin crescent shape. It is at this time that the planet is at its closest to Earth.

The discovery by Galileo in 1610 that Venus displayed the same behaviour as the phases of the Moon and, therefore, that Venus must be moving around the Sun, was a major discovery which ultimately called into question the concept that the Earth was the centre of the Universe.

For the last nine or so months Venus has appeared as the "Evening Star" in our sky giving us an ideal opportunity to observe the phases and brightness.

During the early part of December 2013 it has been shining with tremendous brilliance, some 25 times brighter than Sirius, the brightest star.

On December 6<sup>th</sup>, 2013, Venus was 59.5 million km from Earth and appeared to be larger than just a month earlier but, in reality, we were seeing just a hairline crescent.

On December 21<sup>st</sup>, 2013, the crescent had narrowed further with only 12% of the disk illuminated. By then the planet was only 46.7 million km from Earth.

On December 28<sup>th</sup>, 2013 Venus was less than 43.5 million kms from Earth and only 6% of its disk was illuminated.

To see the planet it was then necessary to observe it while it was still high in the sky, before sunset.

After the first few days of January 2014

Venus will be too close to the Sun to observe and, on January 11, Venus will transition from an evening "star" to a morning "star" and will appear to pass between the Earth and the Sun (Inferior Conjunction).

Note that Venus and Earth will not be in an exact line as happened on 6 June, 2012 when a rare transit of Venus took place.

The dark side of the planet will face Earth although a thin crescent should be still present. It will also be at its closest to Earth around this time, just 40 millions km away.

On January 17<sup>th</sup>, 2014 Venus will emerge as the new "Morning Star" about half an hour before sunrise and it will remain the "Morning Star" for the next nine-and-a-half months.

Oh, and what does Venus' atmosphere consist of?

Almost entirely carbon dioxide (96.5%) and a small amount of nitrogen (3.5%), with clouds consisting primarily of sulphuric acid. Don't try to breath it! 70% of the Sun's light bounces off these clouds.

To offer a comparison, our Moon reflects only about 10% of the light that hits it but because it is closer to Earth it looks bigger and brighter.

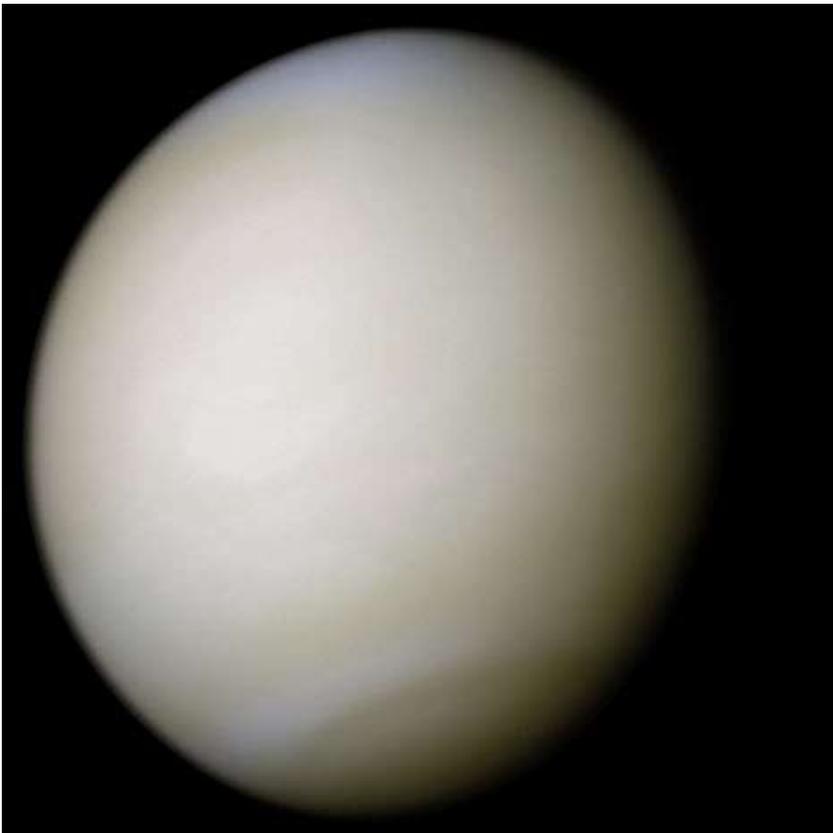
If you missed the glorious sight of Venus during December 2013 you will have to wait until July 2015 to once again see the planet shining as brightly in the evening sky.

*Josephine Lindquist*

Sources:

- Article by Joe Rao, at [www.space.com/23495-venus-planet-phases-explained.html](http://www.space.com/23495-venus-planet-phases-explained.html)
- <http://earthsky.org/space-brightest-planet-mirrors-venus>

*Venus in real colour as seen by Mariner 10  
Picture credit: NASA*



# Gaia, ESA's latest astrometry mission

Astrometry is the oldest branch of astronomy and one of the first natural sciences developed. It is the study of the geometrical relationship between stars and other celestial objects.

Sky mapping was developed by almost all ancient civilisations, whether for practical reasons or for religious and superstitious ones.

From naked eye observations with the aid of the most rudimentary instruments the Greek astronomer Hipparchus was able to position more than 800 stars with a precision of less than a degree.

More stars were added along the centuries, mostly by Islamic astronomers but the precision was not much improved before Tycho Brahe. His catalogue, completed in 1598, had a precision of about 1 arc minute or 1/60<sup>th</sup> degree.



*Test Deployment of the 10 m Deployable Sunshield Array*  
Image credit: ESA-M. Pedoussaut

Then, in 1725, the invention and the use of a telescope allowed John Flamsteed to publish his own catalogue of 3000 stars with a precision of 20 arc seconds.

In the meantime, Edmund Halley noticed, in 1718, that the positions of Sirius and Arcturus differed from the positions chartered by Hipparchus by more than half a degree: this was the first confirmation that the heavens were not immutable.

Finally, it is the German astronomer Friedrich Bessel who, for the first time, was able to measure the parallax of a star, 61 Cygni, and therefore calculate its distance, approximately 11.5 ly or 3.5 pc.

The next revolution came with the invention of photography: astronomers would no

longer have to look through telescopes and transcribe their observations but just capture a map of the sky on a photographic plate.

This technique allowed astrometry to make giant strides at the beginning of the 20<sup>th</sup> century but soon reached its limits: as any amateur astronomer knows the Earth's atmosphere is extremely turbulent and it greatly limits the quality and precision of visual observations. It is therefore not surprising that the catalogues published by the end of the century contained more stars but the precision was not very much improved from decades before.

The only solution was to go to space and, in 1968, French astronomer Pierre Lacroute suggested a dedicated space telescope to measure stellar positions.

The concept was later developed by an international team of astronomers and named Hipparcos (High Precision Parallax Collecting Satellite).

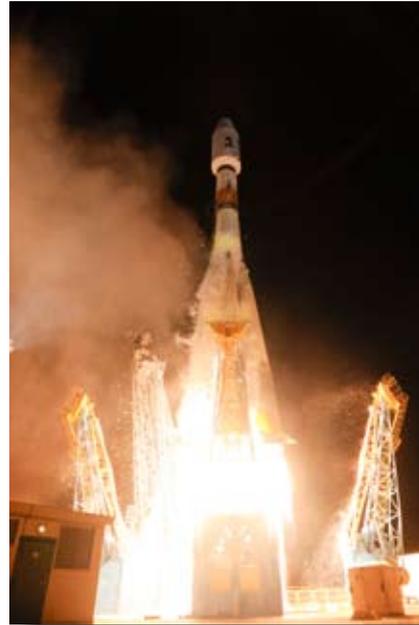
Hipparcos was launched in 1989 and 2 catalogues were released; the first one in 1997 contained the position, parallax and proper motion of 117 955 stars with a precision of 0.001 arc seconds and the second one, published in 2000, contains the position and proper motion of 2.5 million stars but with a lesser precision.

In the early 1990s, ESA called for proposals for a successor to Hipparcos and GAIA was adopted by the ESA's Science Programme Committee.

Initially, this programme was based on an optical interferometer, hence its name, the acronym for Global Astrometric Interferometer for Astrophysics. Though the spacecraft is now equipped with 2 "regular" telescopes the name has stuck.

Gaia was launched on December 19<sup>th</sup>, 2013 from the Kourou spaceport in French Guyana, using a Soyuz rocket.

As you read these lines, Gaia is heading towards the Earth-Sun L2 Lagrange point, approximately 1.5 millions km from Earth, which it will reach around January 10<sup>th</sup>, 2014.



*Gaia's lift off*

Image credit: ESA-S. Corvaja

During its planned 5-year mission, Gaia will measure the positions and velocities of about 1 billion stars with an accuracy down to 24  $\mu$ s (micro arc seconds).

Though representing only a one percent sample of the estimated number of stars in our galaxy, this will provide astronomers with a wealth of information covering a wide range of research fields: from solar system studies, galactic astronomy and cosmology to general relativity.

For more information, you can consult the very informative ESA website at <http://sci.esa.int/gaia/>.

Jean-Luc Gaubicher

Sources: European Space Agency  
Wikipedia



*Gaia's in orbit Artist impression*  
Image credit: ESA

# Membership Survey 2013 Report

Last year the committee decided we needed to know more about our members so that we could serve them better, therefore we prepared a survey and asked you all to fill it in.

This report will look at some of the more interesting results from this survey and provide some information on what we plan to do based upon those results.

## Participation

Out of approximately 100 members, we had 36 respondents to the survey request. Although we would have liked a higher rate of participation, this hopefully is enough for us to get a statistically significant sample of the membership.

Our thanks go to all those that took the time to complete the survey.

## General Meetings

One bit of feedback that we have already acted upon is that members wanted to know ahead of time at what level the lecture at the general meetings is targeted.

Bob Fuller does a wonderful job of ensuring that we have a guest lecturer at each monthly meeting and this included a star speaker at the last July meeting with Nobel Prize winner Brian Schmidt.

Based on your feedback, he is now asking each speaker to rate the level that their presentation will be pitched at and this information will be included in the presentation in the monthly events email. Hopefully this should help you decide whether the lecture is suited to you.

For those who are interested, on a scale of 1 to 10, with 1 being easy and 10 being in-depth, most respondents to the survey wanted the lectures to be around the 6-8 level.

Another bit of feedback we received was to shorten the admin component of the general meeting, so we will look at how we can do this whilst still keeping all members informed of what the committee has been organising.

## Library

A few respondents didn't realise that we have a library at NSAS and many of the others don't actually use it.

The most common reason for this is that it hasn't been terribly accessible of late.

We are now trying to improve this situation by putting all the books on racks on a trolley that can be easily wheeled out at meetings and books can be browsed through without the need to take them out of boxes and lay them out.

Our thanks go to Peter Korber for sourcing this trolley for us.

We are also cataloguing all the books and will make this catalogue available on the website once this process is complete.

## Observing

Almost all respondents had a telescope and we have a wide variety of telescopes across our membership.

We also asked on which night (Friday or Saturday) members wanted observing, and the response was overwhelmingly for Saturday, so we have now changed our observing schedule accordingly.

## Reflections

We asked about your interest level in Reflections, our quarterly magazine. The vast majority of you read it and consider it to be a fairly important part of your membership.

Most of you are happy with the change to digital format. However, and unfortunately, the willingness to contribute articles to the magazine was not particularly overwhelming.

## New Membership Experience

For recent new members, the feedback from the survey was that we could do a lot better to improve the new membership experience.

This is something we're now working on and are putting some strategies in place to make new members feel more welcome.

For example, we are currently in the process of creating a welcome pack for new members to give them all the information they need about what the society does and how they can participate.

## Conclusion

Once again, thanks to those who took time to fill in the survey.

We gained a lot of insight into the wants and needs of our membership and the committee will use this information to serve you better into the future.

*Chris Anderson*

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# Geoff Welch Literary Competition

The ballot for the 2013 Geoff Welch Literary Competition was held at the September General Meeting.

This year, we had 10 articles by 6 authors in competition and the winners are:

- Lydia Bell for "The Great Melbourne Telescope" (October 2012)
- John Walker for "The Jens Olsen Clock" (July 2013)
- David Wallace for "Mars on a Budget" (July 2013)

As usual, each of our 3 winners was presented with a copy of Geoff Welch's book "Humankind and the Cosmos", a \$50 cheque and a certificate.

The competition for 2014 is now open and entries will close with the July 2014 edition of Reflections.

As you can see from this issue, we already have some serious contenders but don't let that put you off, I'm sure you can challenge them.

For the benefit of our new members, this competition commemorates the life and work of Geoffrey Welch.

Geoff was an Honours Graduate, a practising engineer, a lecturer and a professor of civil engineering as well as the author of over forty research publications, mostly related to concrete construction.

He was a valued member of two Astronomy Societies including NSAS, a member of our editorial committee and a regular contributor to Reflections.

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# Our 2013 Christmas Party in Pictures

