



CAPELLA

CAMBRIDGE ASTRONOMICAL ASSOCIATION

Newsletter 143. March/April 2010.

www.caa-cya.org

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The Mystery Objects Quiz. Tony Phillips (the previous winner) hands John Hall the trophy after winning the annual quiz at our December meeting. The second part of the prize is a picture of the Mead Building built in 1824 where the star originally came from (they were around the base of the dome) and when the building was restored in the 1990s the stars were replaced and the CAA was given one. The third part of John's prize is to supply the mystery objects for next year's quiz!!

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Please note that subscriptions are now due. See CAA News for details

Cambridge Astronomical Association and Cambridge Young Astronomers

President: Dr. David Dewhurst

Chairman: Brian Lister

Treasurer & Membership Secretary: Mickey Pallett

Committee: Dave Allen, Kevin Black, Paul Drake, Clive Gilchrist, Clive Holt, Barry Warman

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Chairman's Report.

I wonder how many people have noticed when I do a Chairman's report that I pinch the one from the previous year and just tweak it here and there! However this is my last Chairman's report as I am standing down as Chairman at the AGM after nine years. So what have I achieved in nine years? Well, actually not a lot and my efforts can be likened to Dr Beeching's axe of the railway system over a period of about nine years from 1963 – coincidence?

First to go was Vetscopes, a monthly telescope building session at the Vet School workshop, building telescopes for members. Next to get the Lister axe was our second observatory, closely followed by the CYA newsletter. But the hatchet job carried on remorselessly with members' evenings coming to the end of the line, and then in 2003, just like an under-used rural station, our first observatory was ruthlessly closed and the telescope moth-balled. Next to run out of steam was our policy of sending every member a newsletter – all in the name efficiency.

With all this streamlining what has happened to membership numbers? Absolutely nothing! For all my years as Chairman, membership has hovered between 360 – 380 families which means over 900 – 950 members. I like to think I've consolidated our position, others might say I've been ineffective. However all these cuts were necessary because of the time wasted running these activities and the number of people volunteering/attending was falling. So it's better to do fewer activities but do them well, rather than overstretch ourselves.

So why am I stepping down? Someone else (with an ego of a moderately sized planet) had their eye on the job, and I felt that that person would do the Association no favours whatsoever. Thus I volunteered, but now that the threat has gone, I feel it's time pass on the job to someone else, as I am uncomfortable doing certain aspects of the Chairman's role. (I'm more of a background person rather than someone who's centre stage.)

What about the Chairman's report for 2009/10? Well just read the one from 2008/9 and tweak it a bit. What I will add is that it was our fiftieth anniversary, and we had a small number of low-key events including Birthday cake, a visit from the Mayor and a group photograph – nothing Earth-shattering, but I feel the Association is fit for another 50 years.

Best wishes, Brian

Speaker Meetings

Friday 19th March 2010

The Micheal Penston Lecture

“The Measure of the Universe - A Crisis for Cosmology.” Professor George Efstathiou

George Efstathiou is the Professor of Astrophysics (1909) at the University of Cambridge. He received his B.A. in Physics from Keble College, Oxford in 1976, and his PhD in Astronomy from Durham University in 1979. His first postdoctoral appointment was at the Department of Astronomy, University of California, Berkeley. He spent the next eight years at the Institute of Astronomy at Cambridge, beginning as a Postdoctoral Research Assistant and eventually becoming Assistant Director of Research. In 1988, George was appointed to the Savilian Chair of Astronomy at Oxford University, where he served as Head of Astrophysics until 1994. George returned to Cambridge in 1997 and has served as Director of the Institute of Astronomy since 2004.

He has been appointed as the first Director of the new Kavli Institute for Cosmology here at Cambridge. He has wide interests in theoretical and observational cosmology and has contributed to studies of large-scale structures in the Universe, galaxy formation, dark energy and the cosmic microwave background radiation. He is a member of the Science Team for the European Space Agency Planck Satellite, launched in May 2009.



Recent observations have revealed the surprising fact that the expansion of our universe seems to be accelerating, rather than decelerating under the action of gravity. This raises a number of difficult problems for theoretical physics. Firstly; the acceleration requires a small but non-zero vacuum energy about 120 orders of magnitude smaller than predicted by fundamental physics. Secondly, if this acceleration continues forever the universe should be pervaded by Boltzmann brain rather than normal life-forms. It seems as though the only way of avoiding these problems is to argue that the universe is about to end on a relatively short timescale. An accelerating universe poses some very difficult problems for cosmology. George believes these represent a crisis for cosmology.

Michael Penston was based here at the Institute of Astronomy. In 1990 he was due to give a talk to the CAA, but had to cancel due to illness. Sadly, Michael died soon afterwards. In March 1991 the CAA held a lecture in memory of Michael, and a collection was made for Cancer Research. By the following year a fund had been set up in his name, administered by the Royal Astronomical Society, to help up-and-coming astronomers establish themselves in their chosen profession. Each year since then we have asked CAA members to make a donation to this fund.

Annual General Meeting and Speaker meeting.

Friday 16th April 2010

7.30 pm start (doors open 7.00 pm)

AGM agenda
Apologies for absence.
Minutes of the 2009 AGM
Matters arising

Chairman's report (see page 2 of this issue)
Treasurer's report (in the next edition of Capella)
Election of Officers
Election of Committee
Any other business

Followed at 8.00 pm

"VISTA - Visible and Infrared Survey Telescope for Astronomy" Professor Jim Emerson



Jim is Professor of Astrophysics at Queen Mary University of London and led a consortium of 18 universities in the UK which made a successful bid to fund VISTA. He was an undergraduate at Cambridge, and is here on a sabbatical year. His early survey work was using a balloon-borne telescope, and then the Infrared Astronomy Satellite IRAS. His astrophysics interests are in surveys and star formation.

VISTA is a telescope completed in December 2009 and has 4.1 metre mirror. It is the largest mirror of this shape and of such short focal ratio - just $f/1$: polishing it took 2 years. It has just starting major surveys of the Southern Sky from Chile. The talk will cover the science drivers, the sociology of getting a £38 million telescope funded and then run by a multi national observatory, some technical hurdles and some early results.

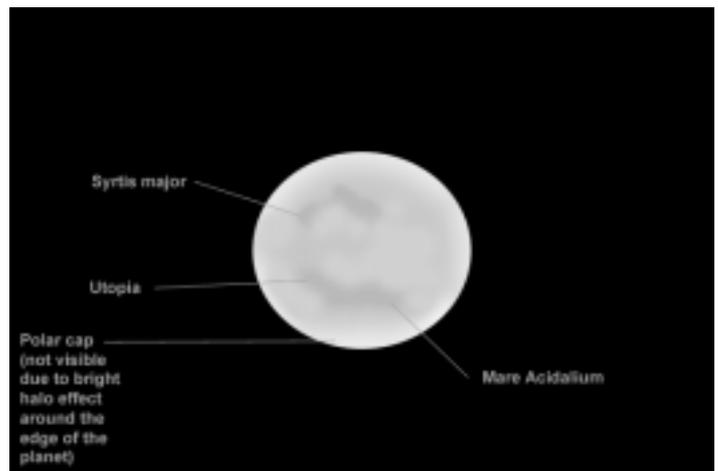
Members' Contributions

A Quick Look at Mars

by Dave Allen

Mars seems all the rage at the moment so I thought I'd give it some observing time through my 12" dobsonian. It took a good couple of hours for the scope to cool down which was really needed to get the best viewing possible and is essential when using higher magnification on planets. I've been told about and warned that Mars is always disappointing when looking through a scope and for many that is true. People will come away from the eyepiece thinking it looks more like just a very bright disk with no features at all. I agree it is very tricky to observe and the details are usually small and bright but with a bit of patience after a while you will start to see the subtle dark and light albedo features which are an absolute joy to see. This particular night the more I looked the more I could see (until conditions didn't allow) It's a great sensation getting to see the features on another planet, some of which have an uncanny resemblance to continents on earth, especially Syrtis Major which looks like the continent of South America and is quite a humbling yet chilling experience. Atmospheric conditions played a big part in my observations and were distorting the view of the planet but quite frequently there would be absolute clear and steady spells lasting only fractions of a second but it's those moments that the features really become obvious. This is a sketch taken from

the night and reproduced in Photoshop. For those who haven't managed to see Mars through a scope then this is pretty much as true a representation as you can expect to see through an average telescope, even our hire ones. You can capture much better, more amazing results by using imaging equipment on Mars but for me that is a completely different road all together which I haven't gone down (yet). Thus I was still quite amazed with what I could see visually though the eyepiece and well worth the effort.



CAA Library

I have recently taken over the administration of the library from Barry Crellin. He has put in a lot of effort over the past years, and I would like to thank him for this and his help during the handover period. We have carried out an audit and there are quite a few books that have been out on loan for some time. Could I ask that you have a look through your books at home and if you find any CAA books amongst them that are overdue, can you let us have them back at the next meeting, please?

Otherwise Brian will be on the 'phone to chase you...

After the rush of overdue books is out of the way, we will implement a regular chasing of late books. Whilst it's not always possible for members to attend every monthly meeting, we would like books to be returned after two months. Your help in returning items within this timescale would be most appreciated.

Kevin Black

Imaging Mars

By Mick Jenkins and Paul Fellows

Magazines are full of advice about how to do imaging, but in general they tend to say things like "just use a web cam" and "stack the images" and so forth. They make it all sound easy...

After grabbing a few tentative images of the moon then, next thing you might well think of turning to is the planets – and where better to start than one of the nearest. Mars perhaps?

Mars orbits the Sun just outside the Earth's orbit taking almost exactly two years to do a lap. Sometimes then, when the Earth catches up with it and passes by in the inside, we come quite close to it – about 40 million miles – before moving ahead round our shorter orbit, leaving Mars to recede into the distance. Twelve months later, the Earth will be back in the same spot, but Mars will be

no where to be seen. It will have done half an orbit, and be on the far side of the Sun, as far from Earth as it can get at about 250 million miles. (If you could see it, perhaps during an eclipse of the Sun, it would appear over 6 times smaller than at closest approach).

So, anyway, the best time to see it, at these closest approaches – called "oppositions" because the planet is opposite the Sun in the sky, appearing due south at midnight – happens once every two years – and we have just had one.

Paul's first attempt - 2004

The first thing I found when I pointed my scope at Mars with a camera attached was just how small the image is -just a very tiny dot covering a few pixels. Even



Mars in 2004, with a hint of a polar cap, and perhaps a few darker markings? These were taken with a Nikon Coolpix digital camera mounted through the eyepiece.

with the best focus, and adjusting the exposure time for the image there was not much hope of a good result – and indeed, the pictures I got were pretty poor. Compared that is to the images in the aforementioned magazines.

November 2005 – Paul’s second try

I was lucky enough to acquire a Meade “lunar planetary imager” - and thought this would be the solution. This is pretty similar to a simple web-cam, and slots into



My ‘scope is a 250mm diameter f/4 reflector – which means it has a focal length of 1000mm. With prime-focus imaging like this, the longer the focal length, the bigger the prime-focus image turns out to be, covering more pixels on the detector. “f/4” and 1000mm is short. It gives me a wide field of view – which is great for some things, but not so good for Mars.

the focuser without an eyepiece. It captures the image from the main mirror directly – so called “prime focus” imaging. This should be an improvement compared to using the Nikon Coolpix (which has a fixed lens) with an eyepiece, for the simple reason that there are fewer layers of glass involved, each of which of course introduces more problems. The downside is that you are basically stuck with the size of the image – you can’t change eyepieces to

Mick’s scope is smaller at 200mm but has a focal ratio of f/10 – giving it a focal length of 2000mm – twice that of mine. This means that his images are twice the size on the chip, even though his scope is a little smaller!



play with the level of magnification, and you can’t use the camera’s zoom functions either.

Anyway, I gave it a try immediately. Mars was receding from Earth as we got away from opposition and showing a smaller disc as a result. And the image was really tiny!

However, there is something we can both do to increase the size of the image.

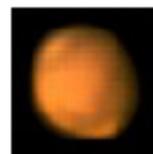
We can add a Barlow lens. This is a small diverging lens. With this, you get the effect of a longer focal length primary, and so the image is bigger on the chip in the camera.



Barlow lenses are usually “x2” - but can be x2.5, x3 or even x5

Anyway, back to the images...here is one using the LPI and “2x” barlow lens. You can see that the detail level was **i n d e e d**

improved. You should see that Mars is not a full disc. This was taken a long way from opposition and our oblique view of the planet is letting us see its day-night terminator line on the right. You can also see both north and south polar caps, and some markings.



2010, Working together

Jumping ahead then to 2010, and the present opposition. Mick sent me an image that he had obtained with his set-up. You can see how it is very sharp and the polar cap is very well picked out



But there is not so much surface detail on it. It was taken by recommended method of a 2x barlow, an imager, and capturing a video file with about 1000 frames – and then combining and stacking them with software to make one composite image.

Seeing this inspired me to have another go at Mars. So on the next clear night, I went at it with the LPI and the 2.5x barlow lens. (The stronger the barlow lens, the harder it is to get a really good focus, and you do need that!).



And this is the result. Smaller, but showing the north polar cap and the ‘Syrtis major’ - the dark bit that sticks up at the lower right. There is also a hint of some cloud tops at the right hand edge.

Pushing up to the x5 barlow lens I was able to get some bigger images.

You can see how over three hours or so, the planet has rotated.

Blocking the Infra-red

In sharing this with Mick, we realised that I was putting an infra-red blocking filter over the imager. I had



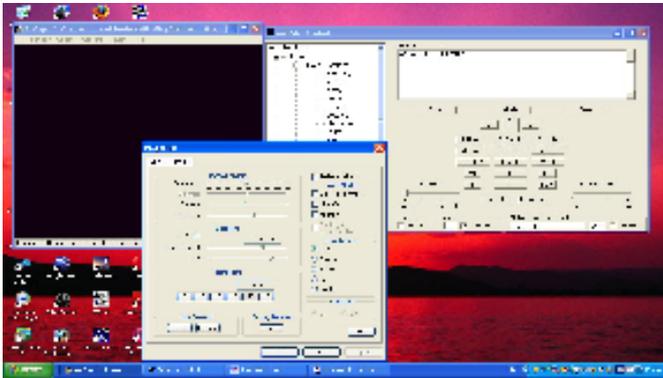
read that this was important somewhere, and it does make a difference. Without it there is a lot of Infra-red light in the image, because Mars is fairly warm, and the camera chips “see” this as white and it tends to wash out the image. I thought this might be why Mick’s image was looking a bit “polished”.

Sure enough, Mick responded, and after the next clear night, using the blocking filter, he was able to come up with an even better result. I’m sure you will agree it is pretty good!

What follows is Mick’s description of how he went about this final image.... Paul Fellows

During January February the planet Mars is at aphelic opposition and is ideally placed at magnitude – 1.0, 14 arc second diameter and high in the sky in the constellation of Cancer, for visual observing and a spot of imaging. This article is my experiences of imaging the planet Mars, I am still learning and finding new ways to improve my technique, this method works for me, hope you find it interesting.

For my imaging setup I use a Cassegrain LX200 GPS 200mm f/10 with a Celestron NexImage webcam both connected to a laptop. This enables me to control the NexImage camera and operate the scope’s micro focuser and pointing remotely, and I can sit in the shed in the warm!



Camera and Telescope control panel

The scope is set up in the normal way, aligning on two bright stars using the telescope hand controller. I allow about 45 minutes for the scope to cool down to the ambient temperature using the time to set up the laptop. I then visually observe a star to check the collimation and then move on to Mars to gauge the seeing conditions under different eyepieces.

With everything set up and the camera fitted on the diagonal with a 2X barlow, I bring up the AMCap software, then I manually focus the scope using the webcam

image, then I retire to the shed to make the final fine focus adjustments, centre the image using the remote hand controller and am ready for the next stage.

The next step is to adjust the Camera control, I prefer to manually adjust the exposure, colour balance is set to Auto, the shutter speed is set to achieve the best picture. Next the most important job is to set the capture file location on the computer and name the video image, this must be carried out for each video capture, I use name of object date and time (Mars 30 01 2010 2230). Next I set the Video time length, I would normally use 50 seconds which give 1200 frames. We are now ready to take the first image of the night.

With the first image ‘in the bag’ it’s not easy to assess the video and the amount of detail captured so I carry out a verification check. I do this by a quick process check using RegiStax. it only takes a few minutes and it helps to see if the image looks reasonable. I carry out any necessary adjustments, recheck the focus, set the capture file name and take a number of videos, usually about 10.

The videos are then ready to be processed at a later date in RegiStax 5 and final finishing in PhotoShop.

The final image fig 2 was the best of the 10 video captures, it’s made up of 79 of the sharpest frames out of the 1200 frames taken, the final processing was in PhotoShop, the most useful tool I find is the Levels control in image adjustment menu.

To be able to view the entire planets surface will take a number of weeks but with the British weather it’s not been possible for me, hope you have better luck.

Favourable opposition occur at intervals of 15 to 17 years, here are some Opposition dates:-

- 3rd March 2012 apparent diameter 13.9 arcsec
- 8th April 2014 apparent diameter 15.1 arcsec
- 22 May 2016 apparent diameter 18.4 arcsec
- 27 July 2018 apparent diameter 24.3 arcsec



Image taken 5th Feb 2010 showing the north polar cap clearly visible

Mick Jenkins

Institute of Astronomy Open Afternoon 2.30pm to 7.00pm
Saturday 20th March

As part of Cambridge Science Festival the Institute of Astronomy will be having its usual open day, with observing afterwards if clear.

Lectures

(Seating for this lecture will be available only on a first-come, first-seated basis)

3.00pm Professor Paul Davies on The Eerie Silence

4.15pm Dr John Eldridge on The Good, the bad and the ugly : Science in Science Fiction (suitable for 8+)

5.15pm Prof Gerry Gilmore asking What do we know about dark matter?

6.15pm Hawaiian Starlight A 'cinematic symphony' on film by Jean-Claude Cuillandre

There will be posters and displays on research done at the Institute. There will also be lunar samples and an exhibition in the Institute library about Great Eclipse Expeditions. Of course the CAA will be present with activities for the children and telling the public about us - so we may get a few new members. If you interested in helping, even for a short while, please do come along - you'll be very welcome.

Introduction to Astronomy Course

Wednesdays, 21st April to 26th May 2010

This six week course for those new to astronomy is run by both the CAA and the IoA. Each week there will be lecture followed by refreshments and a visit to another part of the Institute to see what goes on there or a chance to do observing.

21st April - Things that go bump in the night

28th April - Milky Way

5th May - The Universe

12th May - The Sun

19th May - The Solar System

26th May - History of the Telescope

The course is open to anyone 16 and over. The cost is a massive £6 for the whole 6 week course. Full details will be available at our meetings, or at the Institute open day or from Brian tel 01223 420954 (evenings) or email bt121@cam.ac.uk



An image of the partial lunar eclipse taken on 31st December 2009 at around 7.30pm. by Daniel Coe

CAA News

Subscriptions

Subs. are due on 1st April 2010 and remain unchanged; £4 for standing order mandate on-line membership, £5 on-line membership and £10 postal membership. CAA membership covers all the family living at the same address. If you require a receipt please enclose an SAE. Any queries please contact either Mickey or Brian (see page 2 for contact details). Still the best value in the galaxy.

Library changes.

From April there will be changes to the library system. Library cards will be issued to members in order to encourage members to return books (preferably) after one month. What happens if you bring a book back after two months? Nothing much: our librarians might sigh or even occasionally "tut" as we realize life can sometimes get in the way! However after three months you will be asked

to pay £1 fine and a £1 for each month afterwards. All monies raised will go towards new books. Lost books will be expected to be replaced by you or you make a very generous donation to the library.

Loan telescopes

There are usually no long waiting periods for the loan telescopes. Visit our web site (www.caa-cya.org) and click on to book an instrument, or ring Mickey Pallett on 01480-493045.

Public Observing

These continue on clear Wednesday evenings. Doors open at 7.00 p.m. with a short talk at 7.15 p.m. and, if the skies are clear, observing starting at 8.00 p.m. Please ring the Institute on 01223-337548 after 5.00 p.m. to see if observing is on. There will still be a lecture even if the sky is cloudy.

CYA Meetings

7-11 Year Group

Saturday 27th March 2010

"The Eye and Astronomy"

The eye is an amazing bit of kit, and after many many millions of years of evolution the eye can adapt to many different lighting conditions. Of course the eye can still work at low light levels (at night), although not so well as some nocturnal creatures - but owls can't use telescopes! Using our eyes looking through binoculars and telescopes we can see distant and faint objects. In this session we'll be showing you how the images you see at night (and day) form in your brain, how to safely observe the Sun and how to observe faint objects in a telescope so they appear brighter. You will be making an "eye" to show you how much (or little) you see with your eyes, and we'll be fooling your eyes (your brain) with some wonderful optical illusions.

These meetings will be held in the Hoyle Building at the Institute of Astronomy, Madingley Road from 10 a.m. till noon. Free to CYA members; for non-members there is a £1.00 fee.

11-plus age Group

Monday 5th April 2010

"Variable Stars."

Some variable stars are well behaved and fluctuate in brightness in a regular and predicted manner, others do they're own thing and keep us guessing. We'll be looking at both regular and irregular variable stars and explaining why they behave they way they do.

These meetings will be held in the Hoyle Building at the Institute of Astronomy, Madingley Road from 7.15 p.m. till 8.45 p.m. Free to CYA members; for non-members there is a £1.00 fee.

Saturday 24th April 2010

"The Reflecting Telescopes"

In January we looked at refracting telescopes; this month it's the turn of reflecting telescopes. The first reflecting telescope was built by Isaac Newton in 1668, and three years later the Royal Society asked for a demonstration of his telescope, but poor ol' Isaac had forgotten what he'd done with it and had to build another one! Since then the reflector has changed and now is the main sort of telescope used by astronomers, culminating in some truly monster reflectors going to be built in a few years' time.

Monday 3rd May 2010

"Alien Life."

The return of this ever popular topic, with a look at what type of stars might support life to where life might be found in the solar system. Can we guess what they might look like and has the Earth been visited by ET?