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Kellie Castle and garden. See Society news on page 17.
Photograph by Alan Pickup.

Just the beginning! My first year observing in the city

I'd always wanted to learn about the night sky but for one reason or another it always got pushed to the background, but everyone has got to start somewhere and for me the beginning was October 2009 when I bought my first telescope. I was a complete novice and I mean that, I'd never even looked through a telescope! So there I was; I had an enthusiastic desire to learn and a nice new telescope but not a clue how to use it! Thankfully, I'd bought a Heritage 130P flex tube, a manageable 5″ Dobsonian. Once I figured out which end was which and aligned the red dot finder, it was fairly easy to use.

I remember my first target very well, the obvious beginner's choice: the Moon. It was one target even I couldn't miss and it's not affected by the city's light pollution! What can I say, I'd known the Moon for years and yet I didn't know it at all. My first view through the eyepiece was breathtakingly beautiful, the crater detail along the terminator just amazing, and from that moment on I was hooked! The Moon is still one of my observing favourites and one year on, craters like Copernicus, Tycho, Clavius and Plato have become like old friends.

As the lunar cycle progresses the terminator brings the landscape to life as it moves across the surface. I especially enjoy observing around the first quarter when the terminator is well placed for a meander along lunar mountain ranges such as the Montes Alpes and Montes Appenninus. As the Sun rises, the long shadows cast by the mountains and crater rims make for a worthwhile observing session. The shadows cast by the Apennines over the Mare Serenitatis, reveal detail that is just spectacular and it really does feel like you're flying over mountains!

Second target was Jupiter, although the view through the 5″ Dobsonian didn't show much planetary detail, the four Galilean moons were clearly visible. I remember being so excited at seeing my first planet that I'd call over any neighbour who happened to pass by and proudly show them Jupiter and it's moons! I was starting to feel like an astronomer! It was also the first planet I tried to photograph, not that well I might add.

It was about then that I faced the next beginners hurdle, after the Moon and planets what next? By this time, I had joined the ASE and found Alan Pickup's monthly presentations invaluable but soon realised that if I was to find the targets he told us about, I'd have to learn the basic constellations. This was easier said than done, but with the help of a planisphere and the computer programme Stellarium, those dots of light started to make sense; I could see the shapes! It's an ongoing project as I'm still learning! However, it didn't take that long to learn the basics and I was soon on my way and was delighted to find my first nebula; The Orion Nebula, then my

Carol took this image of detail on the Moon with a Canon EOS 550D in movie mode, using projection with a Hyperion zoom eyepiece and the 8″ Dobsonian. 300 images were stacked in Registax. At the bottom left is the crater Copernicus with its terraces and central mountains. Top right is Eratosthenes with its central mountains appearing to indicate two o' clock. Note also the ghostly ancient crater Stadius toward the right and just below the centre line, in size between Copernicus and Eratosthenes. (Caption by Ed.)

first galaxy, Andromeda, I felt a real sense of accomplishment with my new found astronomy skills.

Light pollution makes observing in the city challenging, but a little bit of effort and perseverance brings abundant rewards. I've often been amazed at what can be seen from a car park in the middle of Leith. In March 2010, I bought my 8″ Orion Optics Dobsonian and started to search for and find one target after another. The Pleiades, the Beehive Cluster, the Double Cluster, Albireo, the Ring Nebula, the Dumbbell, the Owl Cluster (NGC457) and the Spiral Cluster (M34) are just a few of the sights I've observed from my city centre doorstep. I've also observed the planets Mercury, Venus, Mars, Jupiter, Saturn and Uranus. The ISS, Iridium flares and the occasional meteor have also been spotted as they passed overhead. I was surprised at how many satellites fly by, so to add a bit of fun to my observing sessions, I will often chase a satellite to see how long I can keep it in the eyepiece. My current record is 25 seconds!

My next challenge is astrophotography and with the help of the ASE Imaging Group and online forums, I hope to be able to capture some of the amazing sights I've seen in my night skies. One thing's for sure, I have more than enough to keep me happily occupied for many years to come!

Carol Gentle

Backyard astrophysics:

Can't see the universe for the stars

If you can't see the wood for the trees, people mean to say you are obsessed with detail and fail to grasp the bigger picture. However, there is also the literal case that deep in the forest you can see only the trees nearby. The nearby trees obstruct the rest of the forest. As you enter the forest from a neighbouring field and look back, you can initially see the field and sky beyond the forest. However, at some depth L_0 into the woods, the field and sky disappear and only trees can be seen. Even deeper, most of the forest itself is invisible and there is no telling how far in we have gone.

No, you have not picked up a copy of *Forestry for Philosophers* by mistake. The forest can be an analogy of the universe. The trees are stars; the end of the woodland is the edge of our island of stars, the field beyond is empty space reaching to infinity. The Sun is the tree we just bumped into, and the dark night sky is the bright field beyond the forest.

Night and day

It has been recognised a very long time ago that the night sky is dark [1,2], and we can confirm this each night even under the light-polluted skies of the city. After the Copernican revolution moved the centre of the universe from the Earth to the Sun, the path was open to re-interpret the starry firmament. It no longer had to be a thin sphere with bright points stuck on it. Thomas Digges [3] in his appendix to his father's *Everlasting Prognostications* drew it as stars distributed throughout space.

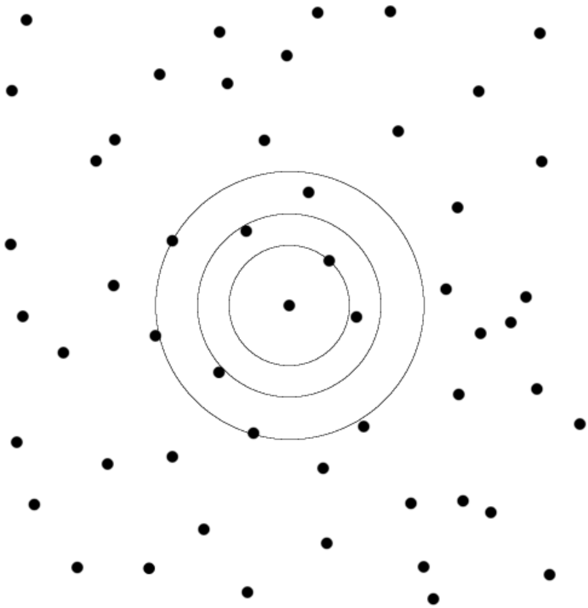

Fig. 1. *Distances to the nearest stars.*

Once we also recognise that the Sun is a star like the others, the forest analogy becomes useful. We make two observations:

1. We see very many stars.
2. The sky as a whole is dark.

With the forest analogy, we can immediately draw two conclusions:

1. The distribution of stars is not infinite. Beyond the island of stars is darkness – empty space or possibly no space at all.
2. Within the island of stars, they fill only a small part of the volume. Stars are very small compared to the distance between stars. Only if the trees are planted far apart can we see through a forest.

How dense the stars?

Can we actually be more specific about how dark the night sky is? Can that tell us something about the Milky Way or the universe? In what follows I use what some would regard as simple mathematics to illustrate how simple, but quantitative, amateur observations can generate quantitative statements about the Milky Way and the universe. If you think the maths is not simple, just skip over the equations and read the text.

Our second conclusion – stars are small compared to the space between them – we can quantify from literature data. We assume all stars are like our Sun, same diameter and same brightness. Although this assumption is wrong, the Sun *is* an average star, and statistically speaking, the assumption is a valid approximation. In three-dimensional space, a star has about 12 nearest neighbours. We can look up the 12 brightest stars in a catalogue to find that their magnitudes range from -1.4 (Sirius) to $+0.8$ mag (Altair) with a median of $+0.1$ mag. We can also look up that the Sun is 150,000,000,000 m away and has a brightness of -26.7 mag. The magnitude difference of 26.8 translates into a distance ratio of 230,000. Multiplying with the distance of the Sun, the distance to the nearest stars is approximately

$$r_0 = 3.5 \cdot 10^{16}\,\mathrm{m} = 3.7\,\mathrm{ly} = 1.1\,\mathrm{pc}$$

Fig. 1 illustrates this as a map of the two-dimensional forest analogy. The inner circle is the distance to the nearest star; the outer circle encompasses 6 trees (the 2D equivalent of 12 stars in 3D). The intermediate circle encompasses three trees and marks the median distance of the 6 neighbour trees.

The density of stars can be calculated from this. Each star notionally occupies a roughly spherical space with a radius half the distance to the neighbours. Accounting also for space between spheres the density of stars is roughly 3/4 of the inverse of the sphere volume:

$$n = r_0^{-3}\sqrt{2} = 3.3 \cdot 10^{-50}\,\mathrm{m}^{-3} = 0.03\,\mathrm{ly}^{-3} = 1\,\mathrm{pc}^{-3}$$

Plugging in the volume of the Sun ($R = 700,000,000$ m), we can calculate what fraction of space is filled by stars and how much of space is empty. The fill factor is the volume of a star multiplied with the density of stars in space:

$$f = (4\pi/3)\,nR^3 = 4.7 \cdot 10^{-23}$$

For each star filled with hydrogen and other gas there is
$1/f = 21,000,000,000,000,000,000,000$ as much interstellar space with hardly any content at all. As forests go, the universe's sprinkling with stars is exceedingly thin.

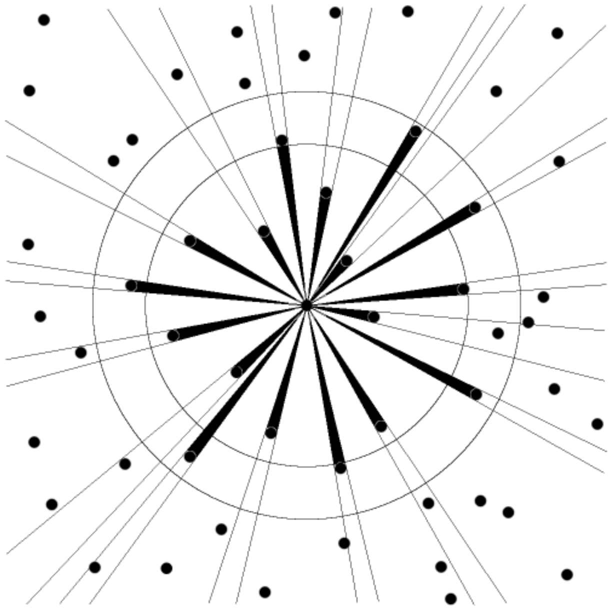

Fig. 2. *A shell of space with stars. Areas of bright sky due to those and nearer stars.*

The looking distance

Assuming a vast space occupied by stars at this density, we should now calculate how our sky brightness builds up from the light these stars send toward us. We imagine a thin shell of space at distance r around us and with small thickness dr. The number of stars in the shell is its volume multiplied by their density:

$$dN = 4\pi n r^2 dr$$

Each star has the same radius R as our Sun and fills a tiny piece of our sky with starlight. This solid angle for any one star in steradian is

$$s = \pi (R/r)^2$$

and added up for the whole shell of stars

$$dS = s dN = 4\pi^2 n R^2 dr$$

Observe that this is independent of the distance to the shell. In the forest, each distance-circle of trees blocks the same amount of vision beyond. Nearby trees are few, but appear large. Trees further away appear smaller, but there are more of them.

Each shell of stars of thickness dr will fill yet another piece dS of our sky with light. If we add up all the shells from zero to some distance L the area of sky filled with light is

$$S = 4\pi^2 R^2 n L$$

Plugging in the numbers, including the radius R of the Sun we get

$$S = L/(1.6 \cdot 10^{30}\,\mathrm{m})$$

The whole sky has 4π steradian. It would be filled if there were shells of stars out to a distance of

$$L_0 = 2 \cdot 10^{31}\,\mathrm{m} = 2.1 \cdot 10^{15}\,\mathrm{ly} = 6.4 \cdot 10^{14}\,\mathrm{pc}$$

For the moment, we will just take this as a theoretical number. If we can measure by what factor the night sky is darker than the surface of the Sun, then the distance L to which we actually see stars is L_0 multiplied by that fraction.

Some may argue that the looking distance is greater than calculated above, because we have not accounted for the fact that some nearby stars obstruct stars further away. This is correct, but it is significant only if a large fraction of the sky is filled with stars. In the actual universe it is dark at night, therefore mutual obstruction does not affect the calculation for the actual universe.

Measuring the looking distance

I have a few reasonably deep wide field shots of the night sky that I took from a very dark site, the Paranal Observatory in Chile. I also have images of the Sun taken from the same place. In the 16-bit FITS images, the Sun registers as about 25,000 ADU. (ADU are analogue-digital-units, arbitrary brightness units. These are specific to the detector, but proportional to the brightness and comparable between images from the same detector.) To compare this with the nighttime image of Fig. 3, I have to correct for the solar filter (factor 100,000), the ISO rating (factor 0.5), the exposure time (factor 7500) and the f ratio squared (factor 13). Fig. 3 shows complete darkness

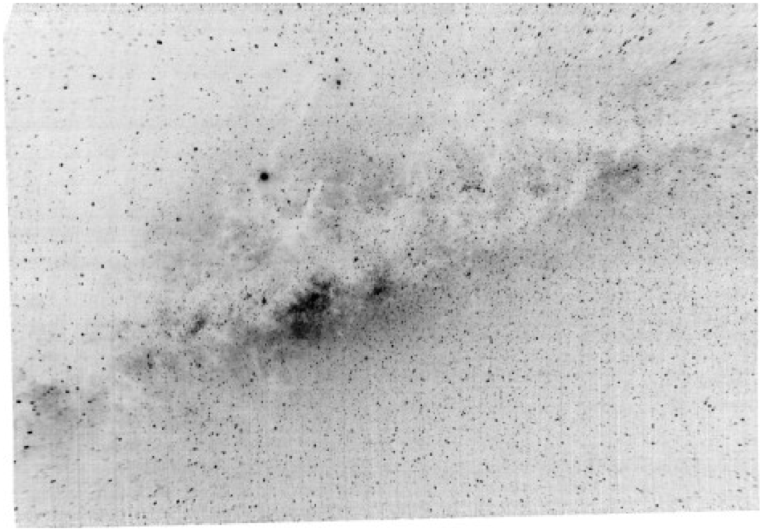

Fig. 3. *A negative image of the Milky Way. Taken in April 2007, Jupiter is near the dark Pipe Nebula.*

as white and 150 ADU as black. In this image the Sun would have a brightness of $1.2 \cdot 10^{14}$ ADU.

In Fig. 3, I pick one area in the brightest part and another area of mostly dark nebulosity. From another picture, I also pick an area around the south celestial pole – some distance below the plane of the Milky Way. In these three areas, the total brightness is simply averaged, sky background mixed with star light and all. The results are 100 ADU in the brightest part of the Milky Way, 45 ADU in a dark patch of the Milky Way, and 30 ADU when we are looking out above the plane of the Milky way at about $-30°$ galactic latitude.

The ratio between the ADU values of night versus Sun is the same as the distance ratio between how far we see stars and the distance L_0.

$$L_{bright} = 1.5 \cdot 10^{19}\,\mathrm{m} = 1500\,\mathrm{ly} = 500\,\mathrm{pc}$$
$$L_{dark} = 7.5 \cdot 10^{18}\,\mathrm{m} = 800\,\mathrm{ly} = 250\,\mathrm{pc}$$
$$L_{high} = 5 \cdot 10^{18}\,\mathrm{m} = 500\,\mathrm{ly} = 150\,\mathrm{pc}$$

The last number is most meaningful in our model of the universe as empty space sprinkled with stars to some distance L and empty beyond that: At the high galactic

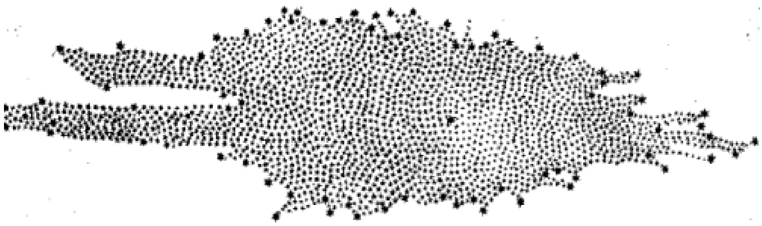

Fig. 4. *A historical illustration of the looking distance in various directions of the Milky Way. Courtesy of Wikipedia and F.W. Herschel [4].*

latitude, we look out of the disc of the Milky Way into the empty space beyond. We are looking 150 pc far at latitude $-30°$. At latitude $-90°$ it should be half that. This implies a half thickness of the disc – in the solar neighbourhood – of 75 pc and a full thickness of 150 pc. This is quite an accurate estimate, the real thickness of the disc of the Milky Way overall is about 300 pc.

Interstellar absorption

William Herschel made similar observations of the Milky Way [4]. He did not have a digital camera to hand, but instead counted the density of stars on the sky. While he thought that we see more stars in the plane of the Milky Way because the distribution of stars reaches to further distances than toward the galactic poles, de Chéseaux had already raised the issue of starlight going missing between its source and the observer [5]. Today we know that both were right. The Milky Way is in fact a disc of stars, and toward the poles we see empty space beyond it. However, looking along the disc the view is actually limited by absorption, and the Milky Way is much bigger than Herschel concluded. In the plane of the Milky Way, the interstellar absorption is 1 to 2 mag/kpc [6], which compares quite well with our looking distance.

In the forest analogy, interstellar absorption is like a fog in the forest. Even though the forest might be infinite, the fog doesn't allow you to see much of it. The Milky Way in that image is a long thin strip of woodland. Look north or south and you can see the fields beyond the forest. Look east or west and you see more trees, a darker forest, but also fog hiding even more trees.

In 1823, Wilhelm Olbers wrote about the transparency of the universe [7], inadvertently repeating some of the earlier work of de Chéseaux. Both favoured a universe that is filled with stars to infinite distances. They realised that, without light going missing somewhere, our night sky should be very bright. Both had worked on comets and had seen their tails disappearing into the space between planets and stars. Interstellar space then was probably not empty and had to absorb light. If there is just a little interstellar absorption then the infinity of the stellar population of space becomes mostly invisible. At the time, this made sense and was not a paradox; indeed Olbers did not use the word.

Like trees, stars die

In the latter half of the 19th century, thermodynamics came about, and absorption in an infinite sea of stars was discredited: With all this starlight about, the interstellar matter would heat up until it radiated as much as it absorbed. The energy cannot disappear and the dark night sky cannot be explained by absorption. Absorption may exist, but it cannot turn a bright sky dark.

It was Kelvin [8], who deconstructed the problem of the dark night sky. He saw a fundamental problem with the infinite sea of stars, because he argued that any star would shine for only 50 or 100 million years. His paper was omitted from his bibliographies and so was lost until Harrison re-discovered it [9]. Well before then Harrison himself [10] had put forward the same argument with a more realistic stellar life time of 10^{10} years. The argument goes like this. Unless you construct a very strange conspiracy of all stars to shine on our little place in the universe at this precise moment of its history, we can expect to see light only from the equivalent of a thick shell of stars with thickness 10^{10} light years ($3 \cdot 10^9$ pc). This is about 200,000 times too little starlight to brighten up our night sky.

There may or may not be stars out to infinity, and the universe may or may not be infinitely old. However, any given star lives only so long and cannot shine forever. Most of these hypothetical stars would be dead and dark. The few that are alive now can give only little brightness to our night sky. (By “alive now”, I mean shining at a time such that Earth receives starlight from them now.)

The Olbers paradox

As we have seen, de Chéseaux and Olbers concluded from the dark night sky that there was interstellar absorption, and Kelvin deconstructed the notion of a universe with infinite and eternal luminous content. It might be infinite and eternal, but even if it were, at any observer’s location only a finite part of it would appear luminous at any given time.

The term “Olbers paradox” was probably first used by Bondi in [11], who also presented it very much in the modern form we recognise. Bondi was a proponent of the Steady State theory of the universe as an alternative to the Big Bang theory. In the former, the *perfect cosmological principle* holds, whereby the universe – at very large scales – looks the same from anywhere (the plain old cosmological principle) and also looks the same *at any time*. If that were true, space would have to be infinite or curved back on itself like the surface of a sphere. And the universe would have neither beginning nor end, but continue forever looking the same.

To reconcile the Steady State universe with the observed expansion of the universe, matter has to be created in the space vacated by expansion. This new matter then forms stars and galaxies to fill the gaps left by the older galaxies drifting apart. This is needed to restore the old look and keep it looking the same forever. Bondi thought that the Steady State universe had a problem with the dark night sky, and showed that redshift could come to the rescue by removing energy from the starlight before much of it arrived in a telescope on another planet.

Science had lost Kelvin's solution for the dark night sky, which was and still is valid. And so, out of the argument between Big Bang and Steady State, comes about the association of Olbers with cosmology, the suppression of de Chéseaux's earlier equivalent work, and the continued fascination of the public with the alleged paradox of the dark night sky.

Jaki [12] has written a whole book proposing that the true paradox is why the night-sky paradox was not recognised sooner. To me the paradox is that we are still fascinated by it as something cosmology has to explain. Big Bang or Steady State – the night sky has to be dark simply because stars don't shine forever. The real universe provides additional mechanisms to darken the night sky, such as redshift, a limited time since stars began to shine, and a limited region of the universe being visible to us. Nevertheless, those mechanisms are not really required.

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   The first booke of Moses, called Genesis. Chap. 1, Verses 3, 4 and 5: "3 And God said Let there be light: and there was light. 4 And God saw the light, that it was good: and God divided the light from the darkenesse. 5 And God called the

light, Day, and the darknesse he called Night: and the euening and the morning were the first day."

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   Olbers had three given names, Heinrich Wilhelm Matthias. In Bremen *und umzu* he is known as Wilhelm, which was his *rufname*. His paper appeared in a year book *for 1826*, but it was submitted and and the book published *in 1823*. In modern writing he is often called Heinrich, and the year of publication is often stated as 1826. Translations of the paper did appear in 1826 in the *Edinburgh New Philosophical Journal* and in the Geneva *Bibliothèque universelle des sciences, belles-lettres, et arts*. On occasion, Olbers has been called a Hamburg astronomer, which is an insult to Bremen. Hamburg has, of course, had great astronomers, but Olbers was not one of them.
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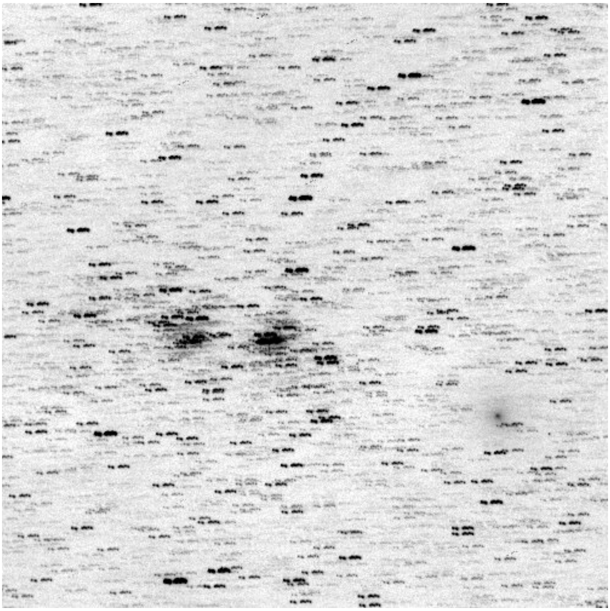
Horst Meyerdierks



Comet 103P/Hartley 2 on 2010-10-07, to the right of the open star clusters χ Per and h Per. This photograph by Horst Meyerdierks is a stack of 8 frames of 5 min exposure each. During the hour it took to take the frames, the comet moved significantly relative to the stars.

Recent observations

Comets

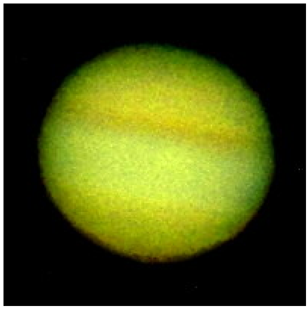
Alan Pickup posted on the Flickr group an image showing C/2009 R1 McNaught in June's twilight sky. Easier to photograph was 103P/Hartley 2 in October. Its perihelion occurred just outside the Earth's orbit with the Earth also on this side of the Sun. As a result the comet was for a while circumpolar and visible all night. Several members observed, or tried. It was quite large and not easy to see in binoculars.

Noctilucent cloud

As reported previously, Horst has teamed up with David Small to run his robotic NLC camera from David's kitchen window in the Borders. The 2010 season of NLC continued to be less intense than 2009 had been. Full reports and imagery are at http://www.chiandh.me.uk/p/Noctilucent_cloud. Comparing the June and July data between 2009 and 2010, Horst had a similar number of nights with data (31 and 29 resp.). Of those nights with data, 60% had any NLC recorded (compared to 70% in 2009). Looking only for bright NLC (brightness 3 to 5) the fraction of nights with such bright NLC was 30%, almost half of the 2009 value of 55%. Hence, the weather was similar, but there was less NLC in 2010, and what NLC there was, was fainter than in 2009.

The previous *Journal* showed an NLC panorama that David took. The Imaging Group's Flickr group (http://www.flickr.com/groups/aseimaginggroup) has a few images by Rachel Thomas.

Various images



Martin Allan, Carol Gentle and others continue taking pictures of various astronomical objects. Some can be found in the Flickr group, and one of Martin's pictures of Jupiter is shown here. Martin used an 8-inch f/10 Schmidt-Cassegrain telescope with 12.4 mm eyepiece. He used a digital camera with 17 mm focal length in afocal projection (i.e. the camera simply replaces the observer's eye behind the telescope). The 165x magnification of the telescope and eyepiece made the effective focal length 2720 mm. The 8 Mpix compact camera had a ≈ 0.5 mm image of Jupiter on the sensor. No further image enhancement was applied.

Sun

Horst Meyerdierks takes an image of the Sun whenever possible and averages his spot counts in 30-day intervals. He reports the following R numbers (number of spots plus ten times the number of spot groups):

2010-03-25 / 2010-04-23	9.1	2010-07-23 / 2010-08-21	25.6
2010-04-24 / 2010-05-23	2.8	2010-08-22 / 2010-09-20	21.2
2010-05-24 / 2010-06-22	13.9	2010-09-21 / 2010-10-20	21.8
2010-06-23 / 2010-07-22	15.8	2010-10-21 / 2010-11-19	32.8

Aurora

In early November, David Small, Carol Gentle and Danny Gallacher took part in flights out of Edinburgh and Glasgow airports to observe the aurora from near the Faroe Islands. They report to have seen aurora on the horizon and that there was movement in the display.

Forthcoming events

- Dec 3rd, 20:00, Church Centre, AUC
  Alan Pickup, Visitor Centre, Royal Observatory Edinburgh
  Starlab show
  The starlab is a mobile, in-door planetarium.
- Dec 15th, 19:30, Juniper Green Village Hall
  Imaging Group
  (The group should hold further monthly meetings,
  dates to be confirmed.)
- Jan 7th, 20:00, Church Centre, AUC
  Dr Andy Longmore, Royal Observatory Edinburgh
  Adaptive optics - obtaining the finest images from large telescopes
- Feb 4th, 20:00, Church Centre, AUC
  Ordinary meeting
- Mar 4th, 20:00, Church Centre, AUC
  Annual General Meeting
  NB: Members only.

Our meetings are open to the public, unless otherwise stated. We are always happy to see new faces. Ordinary meetings take place at 20:00 (Civil Time), usually in the Augustine Church Centre on the first Friday of the month. Any changes to our meeting arrangements will be put on our website http://www.astronomyedinburgh.org

- Church Centre, AUC,
  41 George IV Bridge, Edinburgh, EH1 1EL.
- Juniper Green Village Hall,
  Barberton Avenue, Juniper Green, EH14 5DU.
- Dark Site near Pearie Law,
  4 km south of West Calder, NT 003 579,
  $\lambda = -3°35'28''$, $\phi = +55°48'17''$.

Society news

At most Ordinary Meetings, Alan Pickup gives a presentation about the sky in the forthcoming month, usually including snippets of recent news in the fields of observational astronomy and spaceflight.

On 2010-07-02, Christiane Helling spoke on the circumstellar regions where interstellar dust is formed. On 2010-09-10, Martin Hendry reported on the hopes and challenges of gravitational wave astronomy. On the members' evening on 2010-10-01, Horst Meyerdierks gave an update on noctilucent clouds after the 2010 season had ended, and David Small showed pictured from the excursion to Kellie Castle. 2010-11-05 was billed as a beginners' evening; David Small gave and introduction to astronomy to a packed house with Society members outnumbered by members of the public.

The Imaging Group held further meetings in October and November; it will meet monthly through the autumn/winter months. The group has a Flickr group at http://www.flickr.com/groups/aseimaginggroup, which is used to share images amongst the group, with Society members and with the public.

Kellie Castle

Eleven members of the Society joined the excursion to Kellie Castle on 2010-08-07. Built between the 14th and 17th century, this castle near Pittenweem in Fife, in 1878, was leased to the Lorimer family, who set about restoring it. The Lorimers purchased it in 1948, and in 1970 it was sold to the National Trust for Scotland.

The Society's interest in Kellie Castle stems from the Scottish painter John Henry Lorimer, who was Vice-President of the Astronomical Society of Edinburgh from 1930 to 1933. Lorimer bequeathed most of his estate to the Society; and we still own some of his paintings and a number of chairs from his household and possibly designed by his brother Robert. Some of these items are on loan to the National Trust for Scotland. Lorimer's paintings *Sunlight in a Scottish Room* and *The Long Shadows: Woodland Scene at Kellie* are on display at Kellie Castle. Alan Pickup, as representative of the legal owner of the paintings, has been allowed to photograph them. He has posted the photographs – among others of Kellie Castle – on Flickr at http://www.flickr.com/
photos/astrowatch/4814897945/ and 4815520758/

Website, equipment, books

The Society website at http://www.astronomyedinburgh.org has had a gradual revamp, with new pages about the Imaging Group, and now with all (both) *Publications* *of the Astronomical Society of Edinburgh* online. The entire *Journal*, which began in 1980, is also online, although until 1997 only for Society members.

There is now also a separate members-only area where more detailed information for members can be provided. This is hyperlinked from the front page of the public website.

Members may be unaware of the equipment – telescopes, eyepieces, etc. – that the Society has and that can be loaned to members. Details of this can be found on the members-only website. The Council of the Society is also open to suggestions for more equipment purchases.

Iain MacEachran, Danny Gallacher and Peter Mulholland have been working hard looking through the books the Society has. The library had not been used for a long time, and with our withdrawal from the City Observatory, storing these books is a significant financial burden. About a quarter of the books are now for sale, initially to members. Details of this can be found on the members-only website.

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