The Astronomical Society of Edinburgh

Journal

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Full colour version at
http://www.astronomyedinburgh.org/publications/journals/51

The Earlyburn site in 2001. The Society used the dome at the centre at times for a 300 mm Schmidt-Cassegrain, but mostly used the converted garage (left beyond the electricity pole) for storage, electricity supply and to warm up after observing. To the right is the old main building, which is now likely to be converted into a "single dwelling".
See also the article on page 10. *(Photograph by Horst Meyerdierks.)*

Observing from Edinburgh 1978-1984

I lived in Edinburgh for nearly six years – 4 years studying for a degree in Astrophysics at Edinburgh, followed by a year's teacher training and a year's teaching Mathematics at a school in Dunfermline. During the summer of 1981 I worked for several weeks as a vacation student at the Royal Observatory, debugging and developing a Fortran eclipsing binary analysis program for Bill Napier.

For the first 4 years I was a member of Edinburgh University Astronomical Society (EUAS), serving as its Observing Director from 1979-81. Through this membership I met Neil Bone, who was manning the society's stall at the Freshers' Fair and Dave Gavine, who moved to Edinburgh in early 1979.

When I joined the society it had access to a 10 inch refractor at the Royal Observatory. However, this was demolished in early 1979 to make way for new offices. Shortly afterwards, the society was given permission to use the 13 inch refractor at Calton Hill Observatory and I used this extensively in early 1979 to carry out transit timings on Jupiter – on one occasion timing over a hundred in one night – as part of the IJVTOP programme. IJVTOP – International Jupiter Voyager Telescopic Observation Project – was a programme to compare amateur observations of Jupiter with Voyager images.

Using the 13 inch telescope involved several challenges. It had a clockwork drive which had to be wound up – and then it only ran at half speed! In practice, it was necessary to become skilled at repeatedly gently nudging the telescope in order to keep Jupiter in the field of view. In addition, every so often it was necessary to manually rotate the dome so that the telescope continued to point through the slit in the dome.

Much of the EUAS observing effort was however directed towards meteor observing, at first from near the 10 inch dome within the Royal Observatory grounds, but from 1979 onwards watches were carried out elsewhere on Blackford Hill. The longest watch was for the 1979 Orionids which, despite an early interruption from the police, lasted for over 8 hours – six of the observers staying out all night – recording nearly 200 meteors. Another memorable watch was for the 1979 Geminids – a very windy night during which I was making use of some bushes near the car park for shelter. However, at around 5am a police car arrived in the car park and I was caught in its headlights – the policeman commented that initially he had thought I was a dead body (sat in a deck chair)!

I also observed the 1980 Perseid outburst from Blackford Hill – by now observing further from the observatory so as to reduce the risk of interruption from the police. A highlight, in addition to the unusually high rates, was two Perseid fireballs in quick succession in the northern sky – which Dave Gavine managed to photograph from his back garden.

Despite its city location, Blackford Hill was a good location for meteor observing, given its relatively dark southern horizon. Unfortunately observation became rather difficult due to the policy of floodlighting the Royal Observatory during the Edinburgh Festival each year.

My other main interest was variable stars. I observed them using 10x50 binoculars from Blackford Hill – since I was living over 30 minutes walk away, carrying a telescope wouldn't have been very practicable! The observation of aurorae was less straightforward with Edinburgh Castle and Princes Street being located to the north – Edinburgh Castle produced several convincing "rays". Nevertheless, a few aurorae were recorded. Other more occasional activities included observations of sunspots (you can project the Sun using 10x50 binoculars and see them) and timings of occultations of Aldebaran.

I was never a member of the Astronomical Society of Edinburgh but did attend a few meetings, mostly during the summer months. I also had contact with the Scottish Astronomers Group, attending several

meetings in Livingston and at the Calton Hill Observatory, giving talks on meteor observing at several and, along with Neil Bone, being part of the EUAS team that won the SAG quiz in November 1979 (are we still the reigning champions?). Other events during my stay in Edinburgh included the BAA Meteor Section meeting held at Calton Hill Observatory in 1981 and the 1982 BAA out of town meeting.

I 've been back to Edinburgh on several occasions since 1984 during short holidays. The most fortuitously timed was the single night of March 13 1989 spent in Edinburgh on my way to a stay in Fort William. Leaving the guest house at around 7:15pm I looked up at the sky to see some auroral rays and as the sky darkened it became apparent that a major auroral storm was taking place ...

Tony Markham

Solar global warming

In his book *Gaia – A New Look at Life on Earth*, James Lovelock observed that, over the last 3.5 billion years, the Sun's output has increased by 25 per cent (1). Despite this, Earth has maintained a fairly constant temperature of between 10 to 20 °C. It is surprising facts like this that underpin his Gaia hypothesis – somehow the Gaia system has managed to counteract increasing heat from the Sun.

Lovelock told me that few astronomers writing about stellar evolution consider the dull middle ages of stars. Consequently, few mention this solar warming. An exception was Nigel Henbest, who observed that 'the Sun is gradually brightening, and is now shining about half as brightly again as it was in the early history of the solar system'. He also noted that, despite this, Earth's average temperature has remained 'between the boiling point and freezing point of water'. His explanation for this was that the amount of CO_2 in the atmosphere has 'depleted' (2). Henbest was writing about the time of the publication of Lovelock's Gaia book, and so probably did not realize that he was describing a Gaia activity.

t	S
4.6	0.714
4.5	0.719
4.0	0.742
3.5	0.767
3.0	0.793
2.5	0.821
2.0	0.852
1.5	0.885
1.0	0.920
0.5	0.958
0.0	1.000

But why is the Sun getting hotter? Lovelock told me that it was because, like the Earth, the Sun suffers its own global warming from a greenhouse gas. As hydrogen is fused in the core of the Sun, helium is produced. While most of this helium accumulates at the centre of the Sun, some escapes to act like a blanket and causes the core region to get hotter, so increasing the rate of the fusion reaction. However, according to Kasting, the accumulation of helium at the core causes the latter to contract and heat up, thereby making the nuclear fusion reactions proceed faster (3).

The gradual increase in the Sun's luminosity (S) is usually calculated from Gough's formula:

$$S = S_0/[1 + 0.4\,t/t_0]$$

Where $S_0 =$ present luminosity; $t_0 = 4.6$; and $t =$ time in billion years before present (4). The result is as shown in the table, where the present S is taken as 1.000.

This shows that solar luminosity has increased by 40 per cent since the Earth formed and by 30 per cent since the beginning of life ($\approx$ 3.5 billion years BP). The data also show that the rate of solar warming has been increasing by about 3.7 per cent per half-billion years.

The fact that the Sun was fainter in the distant past led to what is called 'The faint young Sun problem/paradox', the problem being to explain how, with a faint Sun, the Archean climates of Earth and Mars were so mild, or even warmer than today. The answer appears to be that a higher concentration of greenhouse gases (carbon dioxide and methane) was responsible. Subsequently, with the rise of oxygen about 2.3 billion years ago, a decrease in these greenhouse gases led to the paleoproterozoic glaciations, including 'Snowball Earth', when almost the whole planet was a sheet of ice. Glaciation increases Earth's albedo, reflecting more heat back into space. It also lowers sea level, so providing more land area for plants, which can absorb more CO_2.

According to Lovelock, the Sun's heat was ideal for life about 2 billion years ago. Since then, although it has become progressively too hot, Earth has maintained an equable climate. Because plants produced the oxygen that led to glaciation, it can be argued that this was Gaia at work. However it seems to have overdone the cooling, nearly extinguishing all life in a planetary glaciation.

Does this mean that the present warming of Earth is partly due to solar warming? Anthropogenic warming is only about a century old, over which time the increase in solar luminosity has been only about 0.000008 per cent. Nevertheless variation in the Earth's orbit and perhaps minor changes in the solar output, on a shorter timescale than the gradual warming, may be partly responsible.

It does mean that we are frustrating Gaia's attempt to cool the planet in the face of increasing insolation. Left alone, Gaia was probably determined to bring about increased glaciation. Whatever we do about global warming, we should take note that the Sun is going to continue increasing its output. In an earlier article (5), I explained how a solar shield is one of the few ways available to cool the planet. Such a shield will be needed eventually to counter the Sun's own global warming. Left alone, Gaia would eventually have to shift to a hotter world.

Notes and references:

1. I refer to the OUP ed. of 2000, but it was first published in 1979. Unfortunately, Lovelock went on to claim that the Sun's output was 30 % less 3.5 billion years ago. When I pointed out this error (it was 20 % less), he was gracious enough to acknowledge his mistake and told me that I was the first person to spot the mistake in the 27 years since first publication. I noticed similar errors in his latest book *(The Revenge of Gaia)*. When I pointed them out, he was amazed and explained that 'six otherwise good scientists have already reviewed the book without noticing these errors'. I have since pointed the need for further corrections on the matter of the relative strength of the Sun's output.

2. *The Exploding Universe*, 1979

3. James F. Kasting (2005): 'Methane and climate during the Precambrian era', *Precambrian Research*, **137**, 119-129

4. D.O. Gough (1981): 'Solar interior structure and luminosity variations', *Solar Physics*, **74**, 21-34

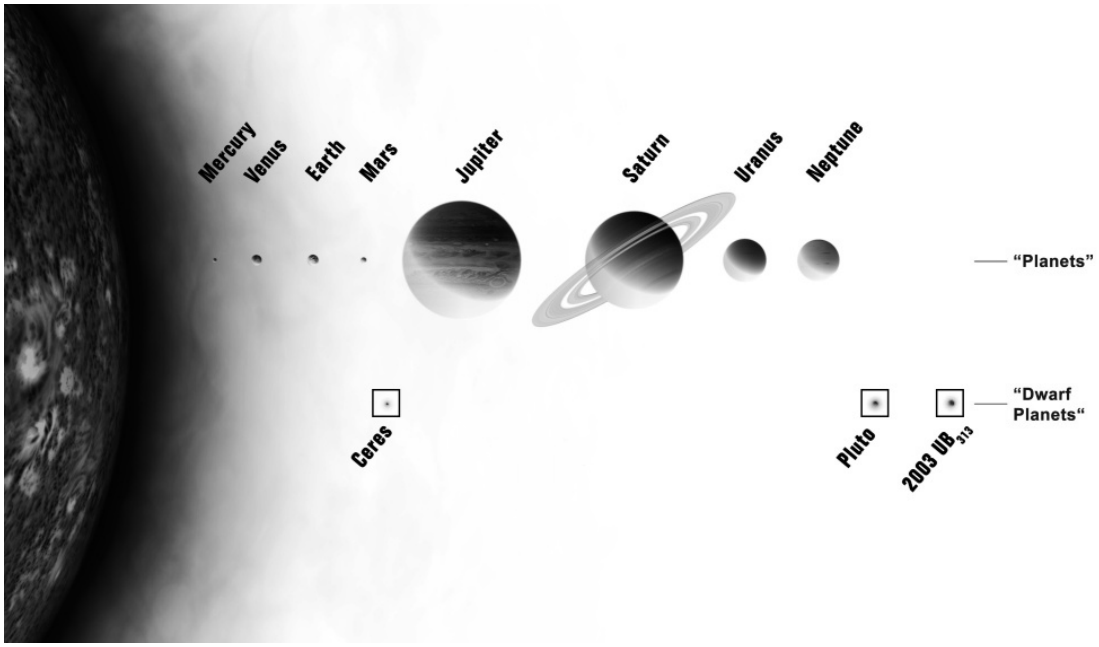
5. Steuart Campbell (2005): 'Cooling the Earth', *ASE Journal*, **48**, 3-6

Steuart Campbell

Pluto and the planets

The planet Pluto has been in the headlines for the last time. The 26th general assembly of the International Astronomical Union (IAU) in Prague was due to decide what is and what is not a planet. A committee had been formed three years earlier to come up with a proposal for the assembled astronomers to vote on. The initial proposal was rejected. Pluto would have remained a planet. But there would immediately have been three further planets: the asteroid Ceres, Pluto's moon Charon, and the trans-neptunian object 2003 UB313. There would have been about a dozen known trans-neptunian candidates for planetship, and more to discover.

In the end the astronomers decided otherwise. They removed much of the complexity of the initial proposal and added the orbit-clearance criterion for a planet. We now have only eight planets: Mercury, Venus, Earth, Mars, Jupiter, Saturn, Uranus and Neptune. Pluto is demoted to being a "dwarf planet", Ceres will most likely be promoted to dwarf planet, and 2003 UB313 is another known dwarf planet. Two or three large asteroids may turn out to be dwarf planets, if they are large and massive enough to pull themselves into a round shape. The same holds for the dozen or so trans-neptunian objects that may fulfil that criterion. According to the IAU press releases the shape of objects with mass above $5\,10^{20}$ kg and diameter greater than 800 km would normally be round due to self-gravity. Be that as it may, Pluto's moon Charon will be just that, a satellite and not a dwarf planet.



This image illustrates the relative sizes of the Sun and the planets. I have magnified the dwarf planets threefold to make them more apparent. (Image courtesy of the International Astronomical Union and Martin Kornmesser.)

The full resolutions passed by the IAU general assembly are:

> **IAU Resolution: Definition of a Planet in the Solar System**
>
> Contemporary observations are changing our understanding of planetary systems, and it is important that our nomenclature for objects reflect our current understanding. This applies, in particular, to the designation "planets". The word "planet" originally described "wanderers" that were known only as moving lights in the sky. Recent discoveries lead

us to create a new definition, which we can make using currently available scientific information.

Resolution 5

The IAU therefore resolves that "planets" and other bodies in our Solar System, except satellites, be defined into three distinct categories in the following way:

1. A planet[1] is a celestial body that
   (a) is in orbit around the Sun,
   (b) has sufficient mass for its self-gravity to overcome rigid body forces so that it assumes a hydrostatic equilibrium (nearly round) shape, and
   (c) has cleared the neighbourhood around its orbit.
2. A "dwarf planet" is a celestial body that
   (a) is in orbit around the Sun,
   (b) has sufficient mass for its self-gravity to overcome rigid body forces so that it assumes a hydrostatic equilibrium (nearly round) shape[2],
   (c) has not cleared the neighbourhood around its orbit, and
   (d) is not a satellite.
3. All other objects[3] except satellites orbiting the Sun shall be referred to collectively as "Small Solar System Bodies".

[1]The eight "planets" are: Mercury, Venus, Earth, Mars, Jupiter, Saturn, Uranus, and Neptune.
[2]An IAU process will be established to assign borderline objects into either dwarf planet and other categories.
[3]These currently include most of the Solar System asteroids, most Trans-Neptunian Objects (TNOs), comets, and other small bodies.

IAU Resolution: Pluto

Resolution 6

The IAU further resolves:

Pluto is a "dwarf planet" by the above definition and is recognized as the prototype of a new category of Trans-Neptunian Objects[1].

[1]An IAU process will be established to select a name for this category.

From opinions that I have heard directly, astronomers seem reasonably happy with or indifferent to this decision. There is some doubt that Pluto's demotion will go down well with others, and attempts to re-instate it as a planet can be expected.

Meanwhile, the Minor Planet Center stake their claim and assign numbers to the new dwarf planets: (134340) Pluto and (136199) 2003 UB313. The other new dwarf planet already has a minor planet number, because it is (1) Ceres. A little later 2003 UB313 is given the official name Eris.

Mike Brown – whose team discovered the "tenth planet" 2003 UB313 – changes his web page to call the object the largest known dwarf planet. The whole planet question had come to a head when it had become clear that Eris is larger than Pluto. Both will now not be planets. People involved with NASA's New Horizons mission to Pluto and the Kuiper Belt were initially not so happy. In September their web site says:

> Poor New Horizons. When it launched in January 2006 it was with all the prestige of the first spacecraft to study Pluto, the last unvisited planet in the solar system. That changed seven months later, when astronomers decided that Pluto was not a planet. For the time being, New Horizons is at least the first mission to a dwarf planet – the new class of objects into which scientists dumped Pluto. But that doesn't mean it will be the first spacecraft to visit a dwarf planet. Under the new definition (it's still unclear), Ceres may be upgraded from asteroid to dwarf planet, and if NASA's Dawn mission launches as planned next summer, it will arrive at Ceres in February 2015, five months before New Horizons gets to Pluto.

For many of us amateur astronomers the new IAU ruling means that we now have seen all planets. To me Pluto is not a regular planet because it is so faint. Uranus is about magnitude 5.8, Neptune 7.9. They are of similar size and the brightness difference reflects their different distances from Earth. Pluto is currently about the same distance as Neptune, but is only magnitude 13.7. This is because Pluto is so small, not because it is so far.

References:

- News from IAU XXVIth General Assembly,
  http://www.iau2006.org/mirror/www.iau.org/NEWS.55.0.html
- IAU Circular #8747, 2006-09-13,
  (134340) Pluto, (136199) Eris, and (136199) Eris I (Dysnomia),
  http://cfa-www.harvard.edu/iau/mpc.html
- Mike Brown, The discovery of 2003 UB313, err... Eris,
  http://www.gps.caltech.edu/~mbrown/planetlila/
- NASA New Horizons home page,
  http://www.nasa.gov/mission_pages/newhorizons/main/index.html

Horst Meyerdierks

SAW 2006

Superstitions being left at home, Friday 13th of October saw the start of the 18th Scottish Astronomer's Weekend.

Hosted by the Stirling Astronomical Society, SAW 2006 got off to a flying start in the Cowane Centre, Stirling.

Alan Cayless, president of Stirling AS and Bill Ward, president of the Scottish Astronomers Group welcomed all in attendance. Alan then asked Alex Houston to explain the running order – after which Alan introduced the first speaker – The Astronomer Royal for Scotland, Prof. John Brown, with his musings entitled 'From Futons to Plutons'. No talk from Prof. John Brown would be complete without a few tricks – he didn't disappoint!

Due to time constraints, a proposed discussion panel had to be cancelled but John Brown did a short question and answer session. Many thanks go to him as he was getting over a spell of illness.

On Saturday, chairperson Alex Houston introduced Alan Cayless – who gave his fascinating talk, 'Through a Lens Darkly', a talk about gravitational lensing.

This was followed by Roger Stapleton with his talk on the instruments of Saint Andrews University Astronomy Dept – both past and present.

On completion, this took the morning session to a tea-break – after which SAG president Bill Ward gave a talk entitled 'New Eyes on the Sky' – telling of the different types of telescopes around the world and of the ones he has visited.

The usual questions and answers completed – SAW-18 broke for lunch.

The afternoon was 'free time' to do sight-seeing or touring or shopping.

The weekend's events restarted at 19:30 with chairperson Dave Gavine introducing Bob Marriott and his talk on 'Esoteric Optics'. This was an interesting talk on telescopes with unusual designs.

Sunday's events started with chairperson Douglas Cooper, who introduced Alex Houston and Bill Samson who spoke about ROE experiences in the late 60's.

10:15 saw Dave Gavine and Tim Schroder and an interesting talk about the life and astronomical interests of James Stewart Mackenzie.

At 11am, after a tea-break there was a members session.

Des Loughney of ASE spoke on his recent results of observing variable stars.

Melvyn Taylor gave a short talk on the Leeds Astronomical Society.

Bill Ward spoke about his solar spectroscope and showed a resultant image.

Iain McEachran of ASE gave a short presentation of the NLC results obtained.

Douglas Cooper showed images of aurora, NLCs and HD video of the moon.

At approx 12:45, Douglas Cooper made the concluding remarks and thanked the people who put the weekend together.

At 13:00 SAW-18 was over!

Huge thanks go to Dave Gavine for his excellent work over the years. This was the last SAW Dave said he'd organise. Thanks Dave. A hard act to follow.

Thanks also to the Stirling AS and the Cowane Centre.

Iain McEachran

Recent observations

Noctilucent cloud

Horst Meyerdierks observed noctilucent clouds on June 30/31 and on July 12/13.

Aurora

http://www.spaceweather.com has an image of aurora over Culloden on September 23.

Comet SWAN

Comet C/2006 M4 SWAN was observed by Horst Meyerdierks and Russell Eberst during October. At about 6 mag in early to mid October it was considerably brighter than the ephemerides predicted. Towards the end of October it had an outburst and was brighter than 5 mag.

Site testing

A group around Danny Gallacher tested a dark site south of West Calder. The conditions were not too good with patches of thin cloud all over, and the Moon rising, soon followed by mist. The site is used by day by a model aircraft flying club. It therefore has good parking and tarmac runways where we could set up our telescopes.

From the president

In the last edition of the Journal we expressed fears about our future at the City Observatory. Some of these fears have not been resolved. The toilets are still in disrepair. The collapsed ceiling which prevents access to the Cooke refractor has still to be sorted. It is a shame that the necessary finance cannot be found to allow proper access to such important buildings in the history of science, astronomy and Edinburgh. Perhaps now is the time to ask our members and the wider public to join in a campaign to get the City Observatory properly restored. I am going to ask the Council of the Society to draft a model letter which people can use to put pressure on the City Council.

On a brighter note the City Council granted the Society 100 % rates relief. This was long overdue. Previously we had enjoyed 80 % rates relief. The remaining 20 % still came to some £ 1,400 and was a substantial burden on the Society. Most of our resources were devoted to the property rather than furthering interest in astronomy. We now, thankfully, have an opportunity to improve our services not only to our members but also the public. This is a welcome development.

The Society started a series of evening classes in the autumn on the theme of the Solar System. Although evening lectures are organised by the Royal Observatory on Blackford Hill we considered that in a city the size of Edinburgh there was room for another series near the city centre. The classes have been reasonably successful. A further series is now being planned for the spring on the theme of ”Stars and Galaxies”. Hopefully, this series will start at the end of January and will continue through eight sessions into March.

Recently I was contacted by photography students at Stevenson College to give a presentation on basic astrophotography projects. This was an interesting experience. I had not realised that astrophotography projects were possible assignments for the students. I think that photography courses are offered in all the Edinburgh colleges due to public interest and demand from all generations. It may be a new fruitful area for ASE members with the appropriate expertise to further knowledge of astronomy. If any member(s) are interested in working with the colleges I would be happy to meet and discuss what can be done. It might be possible to offer colleges, via our web site, what the Stevenson students were after, basic projects in astrophotography, using the new generation of powerful digital cameras.

Des Loughney, president

Earlyburn sold

See also the cover photograph.

Readers will be aware that the Society had a lease to use the Earlyburn site for observing between 1999 and 2005. After an approach from the landlord – which wished to sell the site – the Society gave up the lease. The Society considered purchasing the buildings, but decided against this.

I was passing Earlyburn in June and found a for-sale sign. It was a weekend and a few people were walking around the site to have a look. Looking up the estate agent on the web revealed that the plot of just over one hectare was on offer as a building plot with planning permission to convert existing buildings to a single dwelling house. The asking price was for offers over £95,000. This would not have been affordable for the Society anyway, our hope would have been that the plot was in essence farm land and would have a much lower value.

The history of Earlyburn began in 1961 as an outstation of the Royal Observatory Edinburgh. It was used for the tracking of satellites – a new research topic at the time. The location, remote from interfering lights and with an unobstructed view of the horizon in all directions allowed the tracks of very faint satellites to be recorded photographically. In 1966 a 24/36-inch f/1 Hewitt Schmidt Camera was installed, which could measure satellites to one arc second in position and a millisecond in time. In all Earlyburn was used by ROE for somewhat more than 10 years. (Brück 1983.)

By the 1990s the site was owned by the Natural Environment Research Council. The main use appeared to be some magnetic instruments at the back of the site, probably run by the geophysicists of the University of Edinburgh. For the five or six years that the Society had use of the site we used it much for the same reason as Brück gives for its original choice, dark sky and unobstructed horizon.

My observing logs show 78 dates with observations made from Earlyburn, in particular before I had my own back garden to set up the telescope. These observations include about ten aurorae and an occultation of Saturn by the Moon. The five comets I saw and imaged from Earlyburn include C/2002 C1 153 P/Ikeya-Zhang and C/2004 Q2 Machholz.

Reference:

- Hermann A. Brück, 1983, *The story of astronomy in Edinburgh from its beginnings until 1975*, Edinburgh University Press

Horst Meyerdierks

From the editor

With the jubilee No. 50 of the Journal complete, Dave Gavine has stepped down as editor. I will now try to follow in his footsteps and provide the members of the Society with their Journal, although this will not be possible without your help. More on that further below. I joined the Society only at Journal No. 39, and was wondering how the Society could be 82 years old, but have published only 50 Journals at a rate of two per year. The answer is that Dave in fact founded the Journal “only” 26 years ago. Well done Dave, and thanks for keeping at it! We hope to see more articles from your hand in the future.

Dave has a BSc in astronomy and geology from the University of St Andrews, an MA in geography from the University of Aberdeen, and a PhD in astronomy from the Open University for his thesis on the history of astronomy in Scotland from 1745 to 1900. He was president of the Society 1983-1985 and 1991-1992. The Society presented him with the Lorimer medal in 1995, and the BAA presented him with the Lydia Brown medal in 2003. He has just taken up a new post as director of the BAA Aurora Section.

In comparison, I can only offer you a degree in physics and a PhD in astronomy, both from the University of Bonn. I now spend my days helping to run the computers at the Royal Observatory Edinburgh. I have some experience with society journals: In 1976 a few of us founded a small astronomical society with a journal, and 1982-1988 I was on the editorial team of the journal of the Volkssternwarte Bonn. I therefore know how hard it is to fill the Journal regularly, and that I cannot do it on my own.

The Journal is for the members of the Society, and it is they who know best what should be in it. Let me know what that is and who can provide it. Even better, write something yourself. Perhaps you picked up something of interest in the media, read a good book, found a brilliant web site. We should continue the tradition of reporting observations. Just a brief mention of who and when has seen noctilucent clouds, aurorae, fireballs and exceptional meteors, but also comets, eclipses etc. That would encourage others to step outside and look at the stars every now and then.

Quite a few of us probably combine their holidays with their interest in astronomy. Write a bit about an observatory or planetarium you visited, or an eclipse or transit you chased. Did you buy a new piece of equipment, first light on your new telescope, mount or camera? Let us know in a few paragraphs.

How difficult is it to write for the Journal? Not difficult at all. You only have to pass me the text and any images. My address (electronic and “snail” mail) is at the back of the Journal. If the material is on paper, then that is fine. If you do use a computer anyway, you can save me some time by handing me computer files. Keep the text and the images separate, and don’t do too much work on them yourself. Sure, I need to know which words you want italic, where the paragraphs are, etc. But you shouldn’t concern yourself with hyphenation, serif or sans-serif, line spacings etc. That will all come out in the wash (also known as final layout).

Since No. 38 Graham Rule has put an on-line version of the Journal on the Society web site. In future the web version will be the primary one, because it makes it relatively easy and cheap to provide high quality colour material to a large audience. There will continue to be a paper version: Not all of us want to “go on the web” for this, and some of us will want to collect the paper copies on our shelves. Let me know how important the paper copy is to you. Do you want it in colour? Do you want to opt out of receiving it altogether? Perhaps you compare the two versions of No. 51 and let me know what you think. The paper copy of No. 51 is black and white, and the images have been reprocessed with that in mind; one image has even been turned into a negative. Is that a good idea?

Journal Numbers 38 to 47 had been posted on the web more or less in parallel with the paper version. Numbers 48 to 50 are now also on the Society web site, but they have been converted afterwards from the paper version. Their general appearance on the web is similar to this issue, but the quality of the images is somewhat uneven.

Horst Meyerdierks, editor

Forthcoming events

All these events take place at the City Observatory, Calton Hill, Edinburgh.

2006-12-01	20:00	Graham Dale, The Mars Society Latest news from the Mars probes
2007-01-05	20:00	Dr. David Clarke, University of Glasgow The zodiacal light
2007-02-02	20:00	Brian Kelly, Dundee Astronomical Society It's about time
2007-03-02	20:00	Des Loughney, President, Astronomical Society of Edinburgh Star spots
2007-03-16	20:00	Annual General Meeting

In addition, the current astronomy evening classes on the solar system may continue into December 2006, and a further series on stars and galaxies is planned for January to March 2007. Check on the Society web site (http://www.astronomyedinburgh.org) closer to the time.

Contents of this issue

About the ASE Journal

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City Observatory
Calton Hill, Edinburgh
http://www.astronomyedinburgh.org

The editor of this Journal is
Dr Horst Meyerdierks
71 Cameron Toll Gardens
Edinburgh, EH16 4TF
<editor@astronomyedinburgh.org>