



Letchworth &
District
Astronomical
Society

ANDROMEDA

The LDAS Newsletter

November 2009



Hubble's 120th Birthday

The Hubble Space Telescope was launched almost 20 years ago, on 24 April 1990, but the man after whom it is named goes back much further than that.



Edwin Hubble was born on November 20, 1889, in Missouri and in 1898 the family moved to Chicago. After graduating from the University of Chicago in 1910, he spent three years in England at Oxford University, as one of the first Rhodes Scholars. He studied for his Masters Degree at the Yerkes Observatory of the University of Chicago, and his dissertation was entitled "Photographic Investigations of Faint Nebulae".

In 1919 he was offered a post at the Carnegie Institution's Mount Wilson Observatory in California, by its director, George Ellery Hale, and Hubble remained on the staff there until his death in 1953. His arrival coincided with the completion of the 100-inch Hooker telescope, which at that time was the largest in the world.

Shortly before his death, the 200-inch telescope on Mount Palomar came into operation. It was named after Hale and was the world's largest telescope for nearly 30 years. Hubble was the first astronomer to use this giant instrument.

In 1922 and 1923 Hubble made observations of a type of star known as the Cepheid variables. It was known that the length of their period of change in brightness was linked with their actual luminosity. This meant that by measuring the length of a cycle then an observer would also know the star's maximum brightness. By comparing this value with its apparent brightness, the star's distance could be calculated.

The 100-inch telescope allowed Hubble to observe stars at far greater distances than had been achieved up until then. In 1924 he identified a Cepheid variable in what was then called the Andromeda Nebula and his observations proved conclusively that the star was not within our galaxy but way outside it, and led to the realisation that the Andromeda Nebula was actually another galaxy.

Hubble also showed that the spectra of distant objects exhibited a "red shift" and that the greater the distance, the greater the shift. This showed that the further away that objects were, the faster they were travelling. All this provided observational proof of the expansion of the universe, and support for the "Big Bang" theory of its creation. The relationship between redshift and distance is known as "Hubble's Law".



Hubble at the 100-inch telescope

In 1983, 50 years after Hubble's death, the space telescope that was being constructed for NASA was named after him.

Since overcoming the problems with its manufacture, detected after launch, the Hubble Space Telescope has provided astronomers and the public alike with astonishing images that have helped extend our understanding of the universe.

Hubble observations are still pushing back the boundaries of our knowledge.

Jerry Stone

"Equipped with his five senses, man explores the universe around him and calls the adventure Science."

Edwin Hubble

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Articles submitted for inclusion in this Newsletter are welcomed, and should be sent, in **electronic format**, to the editor, who will then consider them for publication.

The editor is Jerry Stone. E-mail: editor@ldas.org.uk

Articles for the next issue must be submitted by Saturday 16th January 2010.

Opinions expressed by the contributors are not necessarily those of the Editor or the Committee.

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Introduction

Hi everyone,

This is the final newsletter of 2009 - we don't issue one in December - so we're nearly at the end of the International Year of Astronomy, which has probably been the busiest in the society's history!

We have had Star Parties, Public Astronomy Sessions, Meteor Watches, Astronomy Workshops and more. Visits to clubs and organisations such as scouts, cubs and brownies, and visits by them to the observatory. All these activities have involved us reaching out of hundreds of people across Hertfordshire and beyond.

Much of this has been specially arranged for the IYA, but there are many things that we plan to continue with for the future.

2010 is our 25th anniversary and we already have plans for the year, but we are very happy to receive suggestions for other activities. So if there is something you would like to see us doing, then let us know.

In December we are holding our AGM, and we welcome any comments and suggestions from our members. It is your society and we would like to help you make the most of it.

Don't forget that information about all of our events is available on our website – www.ldas.org.uk

Meanwhile I look forward to seeing you at our November meeting on the 29th, which will see the return of Paul Hewett from the Institute of Astronomy.

Clear skies,

Jerry

Jerry Stone FBIS FRAS

Chairman, Letchworth & District Astronomical Society

LDAS is affiliated to :

- The British Astronomical Association
- The Federation of Astronomical Societies
- The Society for Popular Astronomy

IYA programme generously supported by the Royal Astronomical Society



★ Geminids Meteor Watch : Sunday December 13, from 20:00

Unfortunately the Leonid meteor shower didn't live up to the predictions (I did say that I had my doubts...) However Robert and I were out at the observatory on both Monday and Tuesday night. A few others joined us, and although the weather wasn't too good on Tuesday, the gaps in the intermittent cloud on Monday night allowed us to see quite a range of objects, including double-stars, star clusters, nebulae, galaxies, plus Jupiter, Uranus and Mars. In fact we chalked up a pretty impressive list of sights that evening.

We'll have another chance to see some meteors on the night of December 13. As with the Leonids, the peak for the Geminids is very close to a New Moon, so there will be no lunar glare to detract from the display and we will have a dark sky for our observations. The Geminids are reckoned to be the most reliable meteor shower of the year, so maybe the predicted rate of around 100 per hour will turn out to be real. Come along and see ...

Bring along a chair or recliner, and perhaps a blanket, plus nibbles and a hot drink to keep you going. Don't forget to wear warm clothing!

We'll be observing from the hardstanding by the observatory, and we'll also be using some of the telescopes to look at other objects as well during the evening. See page 8 for further details.

This is our final main event of the year, with a last observing evening on December 18th, so take the opportunity to come along and enjoy the night sky.

The first observing session of 2010 will be on Friday 15 January.

★ Society AGM, Annual Quiz and Raffle : Wednesday December 9, 19:30

The December meeting is held on the **second Wednesday of the month**, instead of the last Wednesday, so this year it's on **December 9th**.

Instead of a main speaker, the December meeting sees our AGM. As well as reports on what has been a very busy year, this is a chance for you to put your questions to the committee. In addition you have the opportunity to take a role on the committee. **We are specifically looking for a new Membership Secretary and also a Newsletter Editor. If you would like to take on one of these roles or any other, then do please let me know as soon as possible and I'd be happy to discuss this with you.**

After the AGM there will be mice pies, cakes and drinks for all. This will be followed by **our famous annual quiz**, which is going to be a little different this year, but don't worry - there will still be prizes!

There will also be a **raffle**, and as usual, we would be grateful for donations of any astronomically-related items. Please bring along any offerings to either the November or December meetings.

In order to help ensure that we have time for everything, please don't be late!

An agenda for the AGM will be distributed to members shortly. If you have any points that you would like raised, any questions for the committee or any suggestions relating to the society in any way, then do please let us know. If you wish, your comments can be raised anonymously on your behalf.

★ Observatory Upgrade - A Special LDAS Project

I have recently been over to Cheltenham see the Meade LX200 14" scope that's for sale. There are a number of accessories on offer as well, and we are discussing just what we intend to go for.

If we decide to go ahead, then it will obviously mean taking out the existing 10" reflector and mount. If anyone is interested in this equipment then do let us know.

We will give you more news on this project at the November meeting and in the next Newsletter.

Full details, with a list of dates of all events, can be found on our website at www.ldas.org/IYA.html

LDAS Meetings and Events

Here is a listing of forthcoming events. Our full listing is on our website.

★ A star indicates that places at the event must be booked in advance.

Key: LDAS IYA special event Observing event Observing in towns Monthly meeting
 LDAS members' event Publicity event IYA & other science events

Event	Day	Date	Time	Notes
IYA major event	Thu - Sun	Nov 19 - 29		Schools' Moonwatch Week ● - ○
November Meeting	Wed	Nov 25	19:30	Paul Hewett
Observing session	Fri	Nov 27	19:30	At Standalone Farm ○
December Meeting	Wed	Dec 9	19:30	AGM and annual Astro-Quiz
Meteor Watch	Sun	Dec 13	From 20:00	Geminids ●
Observing session	Fri	Dec 18	19:30	At Standalone Farm ●

- Members are welcome to come along for observing sessions when workshops are taking place, but if they wish to take part in the workshop as well, then **they must book places in advance** (even though they are free), as places are limited. Write to events@ldas.org.uk

We are already looking forward into 2010, which will be the society's 25th anniversary.

What would you like to see us doing next year? Do you have any ideas for speakers, trips, observing activities or anything else? Please write to me, or give me a call on 01438 712000.



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Events for November / December 2009

★ = Places must be booked ☼ = Help required ▼ = Limited places

November		
Mon 23		Jupiter 4° south of the Moon
Tue 24		Mercury 3° south of the Moon
Wed 25	19:30	November Meeting. At Plinston Hall : Paul Hewett of the IoA
Thu 26		Uranus 6° south of the Moon
Fri 27	19:30	Observing Session. At Standalone Farm Centre
Sat 28	19:30	Observing Session. At Standalone Farm Centre
Sun 29		
Mon 30		
December		
Tue 1		
Wed 2		Full Moon. Uranus stationary
Thu 3		
Fri 4		
Sat 5		
Sun 6		
Mon 7		Mars 6° north of the Moon
Tue 8		
Wed 9		December Meeting. At Plinston Hall. AGM and Annual Quiz. Moon Last Quarter
Thu 10		Saturn 8° north of the Moon
Fri 11		
Sat 12		
Sun 13	From 20:00	Meteor Watch Geminids meteors. At Standalone Farm Centre
Mon 14		
Tue 15		
Wed 16		New Moon
Thu 17		
Fri 18	19:30	Observing Session. At Standalone Farm Centre Mercury 1.4° south of the Moon. Mercury greatest elongation 20° East.
Sat 19	19:30	Observing Session. At Standalone Farm Centre
Sun 20		Jupiter 0.6° south of Neptune.
Mon 21		Winter Solstice. Jupiter and Neptune 4° south of the Moon. Mars stationary.
Tue 22		Ursids meteor shower maximum
Wed 23		
Thu 24		Moon First Quarter. Uranus 6° south of the Moon
Fri 25		
Sat 26		Mercury stationary.
Sun 27		
Mon 28		
Tue 29		
Wed 30		
Thu 31		Full Moon. "Blue Moon". Partial lunar eclipse: Barely visible in the UK

October Meeting Review

“The first stars: Peering back to the cosmic dark ages”

By Nial Tanvir

Nial Tanvir formerly worked at the University of Hertfordshire and at the University of Cambridge. He is now Professor of Astronomy at the University of Leicester, where he carries out research into gamma-ray bursts.

Ten to twenty years ago, astronomers had no understanding of the far reaches of the Universe. In the 1920s, Edwin Hubble had proved that the ‘spiral nebulae’ were external galaxies, or ‘island universes’, at great distances from the Milky Way. High-resolution images of the Andromeda Nebula (M31) had shown that it was a great cloud of stars, and the identification of Cepheid variables among them had established that its distance was far greater than the radius of the Milky Way. M31 and the Milky Way are the largest members of the Local Group of galaxies, but there are many millions of galaxies of similar size.

By studying very distant extragalactic objects, astronomers are looking back in time, so these studies enable astronomers to observe the evolution of the Universe.

Hubble found that the spectra of most galaxies showed a redshift, with the absorption and emission features being shifted to the red end of the spectrum, and that this redshift increased linearly with the distance of the galaxy.

The redshift is expressed as $z = \Delta\lambda/\lambda$, where $\Delta\lambda$ is the change in wavelength, and the ratio between recession velocity and distance is the Hubble constant, $H_0 = 68$ km/s/Mpc. Thus measurement of the redshift of a galaxy gives its distance and tells us how far back in time we are looking when we observe the galaxy. In addition, the distance and the apparent brightness of an object can be combined to give its true luminosity.

The distance of the farthest known objects has increased from 2×10^9 light-years in 1955 to about 10^{10} l-y in 1965, about 1.2×10^{10} l-y in 1970, and about 1.3×10^{10} l-y in 2005.

These observations implied that everything in the Universe was receding from everything else, that is, that the Universe was expanding. This is one of the great discoveries of science, and is now understood in the context of the Big Bang theory of cosmology.

The time since the Big Bang limits the distance to which we can see; there is no edge to space, but there is a beginning to time. The first stars were formed about 200 million years (Myr) after the Big Bang, corresponding to a redshift $z \sim 20$; the task is to understand in broad terms how the galaxies have evolved since these first stars formed.

Since the end of World War II, astronomers have used other forms of electromagnetic radiation to study the Universe. Radio waves and some infrared radiation reach the ground, but other forms of radiation (e.g. UV, X-rays and γ -rays) are blocked by the atmosphere. Cosmic gamma-rays can therefore only be observed by detectors on satellites. During the 1960s, the United States launched a series of Vela satellites to monitor nuclear tests from space, and they observed unexpected extraterrestrial flashes of gamma rays from 1969 onwards. These could be single short flashes or a whole series of flashes, and a flash could rise suddenly to maximum and then decay slowly; the rapid variations showed that the source must be very small. If the sources of the bursts were in our own Galaxy, the bursts should be concentrated towards the Milky Way, but in fact they were spread over the whole sky; this showed that the bursts had extragalactic sources and therefore had to be extremely luminous to be seen from these vast distances.

The BeppoSAX satellite, which was launched in 1996, was able to detect the X-ray afterglows of gamma-ray bursts, and so find positions for them accurate to within a few arc-minutes. The first optical afterglow was detected for the burst GRB 970228; the host galaxy had a redshift $z = 0.65$, corresponding to a distance of about 6.5×10^9 light-years. At such distances, gamma-ray bursts are by far the brightest known objects, with luminosities up to 10^{20} times that of the Sun. The explosion that produces a gamma-ray burst occurs when a massive star collapses to form a black hole; the falling material is expelled from the collapsing star as high-velocity jets, moving at almost the speed of light, and these jets are responsible for the burst. The X-ray and optical afterglows are due to either high-energy radiation or shock waves.

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The Swift US/UK/Italia satellite was launched on 20 November 2004, and provided rapid and precise positions for many bursts; the detector sees a large swathe of the sky, and turns to point its X-ray and optical telescopes towards a burst to observe the afterglow. The afterglow of the burst GRB 080319B, at $z = 0.94$, was bright enough to be seen by the unaided eye, and it would have been detectable if it had occurred only 200 Myr after the Big Bang, at $z \sim 20$; it was about 1000 times as luminous as a typical quasar and 10^6 times as luminous as SN 2006gy.

Another gamma-ray burst had $z = 6.7$, corresponding to a look-back time only about 1000 Myr after the Big Bang.

The existence of very remote gamma-ray bursts tells us that stars were being formed at such early times, and also helps to locate their host galaxies. Spectroscopic observations can then provide information about the chemistry of these galaxies. If heavy elements, which are produced by nuclear reactions in massive stars, are absent, the gamma-ray bursts are occurring at about the time of the formation of the first stars.

The most remote gamma-ray burst so far observed is GRB 090423. Observations by the UK Infra-Red Telescope in Hawaii began 20 minutes after the observation of the burst, and a faint and very red K-band ($2.2 \mu\text{m}$) counterpart was detected; the redshift of this source was $z = 8.23 \pm 0.08$. This redshift is greater than that known for any quasar ($z_{\text{max}} \sim 6.4$) or any galaxy ($z_{\text{max}} \sim 7.0$), and corresponds to an age of the Universe of 630 Myr at the time of the burst. High-redshift gamma-ray bursts are rare, but they may be the best route to detailed study of the earliest stars and galaxies, the final frontier of extragalactic astronomy.

Review by **Richard Stratford**



Some gamma-ray bursts may result from a collision between two neutron stars or a black hole and a neutron star. This illustration depicts the turbulent aftermath of such a collision. Credit: Dana Berry/NASA

ASTRONOMICAL MATTERS

Geminid Meteor Watch

After a distinct lack of Leonid meteors, we're hoping to do better with the Geminids. As with the Leonids, this year's peak is close to a New Moon, so we should have the perfect conditions - clouds permitting!

The forecast for this year is very good, and as the Geminids are reckoned to be very reliable, we should have a really good chance to see some meteors.

★ Here's a run-down on the event:

What are the Leonid Meteors?

Although known as "shooting stars", this only refers to the visual aspect, as meteors are mostly grains of dust - whereas a star is a giant ball of fire! The dust is a stream of material trailing from a comet - in this case, comet Tempel-Tuttle - and as the Earth passes through the dust, the particles rush through our atmosphere. This causes friction, which makes the particles glow. Most of them burn up completely; if a piece is large enough to survive and reach the ground, the remnant is called a meteorite.

When and where is the meteor watch?

From 8pm on Sunday, December 13, at the Standalone Farm Centre. Park on the hard-standing and walk up to the observatory. We discovered for the Leonid sessions that the gate to the field is secured.

What should I bring?

A chair - preferably a recliner - so that you can sit back and look up at the sky. You're going to be sitting / lying there for a while, so make sure that you wear warm clothing. A hat will help prevent heat loss, and an extra pair of socks might help your toes freezing! For inside warmth, a flask with a hot drink would be a good idea (though take note that the toilets at Standalone will be closed).

What about a scope or binoculars?

If you want to spend some time looking at other things in the sky as well, then bring your equipment, but it won't be much use for watching meteors, as they flash across the sky very fast, they only last a few seconds and you cannot guarantee just where the next one will be.

If you want to take pictures of the meteors, you need a camera that allows you to take long exposures - say about 30 seconds. Beyond that time you may find that the skyglow becomes too pronounced. What I do is to put the camera on a tripod, facing upwards, with a medium focal length setting, and I just keep taking 30-second exposures. The nice thing about digital cameras is that you can delete the ones that don't show any meteors when you get home.

★ Here are some notes on the Geminids from the Society for Popular Astronomy:

The Geminids are associated with asteroid 3200 Phaethon, rather than a comet, and their meteoroids seem to be rather denser than those in most meteor showers too. Good rates can be seen for around two nights over their peak, but drop away very quickly after the maximum. Unlike many meteor showers, they are easily-observed throughout the night. Regular British observers often consider them the best, reliable, annual shower of the year visible here at present, though the winter weather can be problematic. Geminids are medium speed and often bright meteors, though few leave glowing persistent trains after them.

★ The New Moon on December 16 creates almost perfect viewing conditions, and with a ZHR (Zenith Hourly Rate) of around the 120 mark, there should be a good show this year.

Geminid rates often remain close to their maximum levels for 6 to 10 hours to either side of their best, so we shouldn't have to stay up until 3 in the morning!

120 meteors per hour means an average of one every 30 seconds, which would be great. Let's hope for a good display.

ADVERTS

For Sale – Items to celebrate Astronomy and Space Exploration

Two versions of the GalileoScope

It is 400 years since Galileo first looked at the skies through his telescope. Here is a chance for you to repeat his observations by making your own version of this simple refracting telescope.

There are two versions: A cut-out model (right) which will take about an hour to make, offering 10x magnification, and a press-out version (left), which will take about 30 minutes and offers 6x magnification.



The scopes come complete with instructions and lenses, which are not bad at all. I have used both of these scopes to observe Jupiter!

The special price for LDAS members is just £5 for the large model or £4 for the smaller one.

You can buy them at our next meeting, or by post (contact me for details).

A Working Orrery

This lovely model includes the Sun, Mercury, Venus and the Earth and Moon. The Sun lights up using an LED.

Wind the handle and watch the planets and the Moon moving through space.

The axial tilt of the Earth is shown, and as the Moon travels on it's orbit whilst the Earth goes around the Sun, it is possible to demonstrate seasons and eclipses.

The special price for LDAS members is £40. This item has to be specially ordered.



One Small Step

There's another anniversary in 2009, as it is 40 years since the first men set foot on the Moon, when Apollo 11 landed in the Sea of Tranquility on July 20.



"One Small Step" is presented as the scrapbook of a young space enthusiast whose grandfather worked in Mission Control. In fact it is written by Jerry Stone, who has his own celebration this year, as it's the 40th anniversary of his first presentation on spaceflight.

The book is full of flaps to lift and things to pull out, not to mention some stunning pictures, beautifully printed.

12" x 10" Price: £14.99

"Adults are going to enjoy this just as much as children" – Booksellers' Choice

"Marvellous! Marvellous!" – Sir Patrick Moore.

All these items are available from Jerry through LDAS. See him at one of our events, or write to: info@spaceflight-uk.com

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CONTACT INFORMATION AND OFFICIAL MEETING DATES

If you have any comments or suggestions regarding any aspect of Society activities, do please contact us using any of the details below.

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The LDAS IYA Project Team

Ian Dunbar	John Flook	Sam Hawkins
Alan Pounder	Jerry Stone	Robert Townsend

Committee meeting dates

February 18
 May 20
 August 5
 November 23
 AGM December 9

IYA Project Team meeting dates

January 10 January 25 February 22 March 29 April 19 May 31	June 28 August 23 September 27 October 25 November 29 January 3 2010
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