



January 2009

ARMAGH **PLANETARIUM**
ASTRONOTES

Incorporating **FRIENDS' NEWSLETTER**

Sugar in Space!

2009's Space Odysseys

The sky this month

Canadian Meteorite

Exoplanets spotted!

New Year Message

From Tom Mason, Director

It is hard to assimilate the fact that another year has flown by. But 2009 looms and the plans for the International Year of astronomy are afoot. I think that this ought to provide a huge boost to astronomy as a science that is “cool” for young people, making it easier for them to declare their interest. I am recalling that the Crime Scene Investigation TV series has resulted in a huge boost in students seeking qualifications and work in forensic science. Let’s hope that we can emulate this success for astronomy.

I detect that there is a new emphasis all over the world in promoting a Science, Technology, Engineering and Mathematics (STEM) agenda in schools. Many countries appear to have realised that to fully exploit their young people’s talents they must train lots of them to become engineers or scientists who can make things and invent new processes. The Maths is critical to make sure that the reproduction models work, and that the computers function as planned and so on. I think that China’s amazing progress over the past two decades has been driven by the

Image Credit: NASA



Home Planet In December 1992 the Jupiter-bound Galileo spacecraft looked back and captured this remarkable view of the Earth and Moon from about 6.2 million km (3.9 million miles) away.

trained engineers and scientists who lead the Chinese communist party. These individuals have collectively recognised the importance scientific education to a modern vibrant economy.

“We need more of the awkward people who question accepted dogmas and axioms”

At Armagh we do our bit for the local STEM efforts by promoting scientific careers as the best way to have a really exciting job which is never the same from day-to-day. This surely has an appeal for anyone seeking stimulating and challenging work. I have written before of the benefits of training which allows students to make mistakes, and to learn from them. I still maintain that most of our schools do a fine job of homogenization, making sure that the students presenting to university and other higher education courses are schooled to “write to the test”. We need more of the sparky awkward people who question accepted dogmas and cherished age-old axioms. Only by encouraging this challenging way of thinking can we make progress in unlocking the mysteries that are still abundant in space science.

I have two vivid mental images that I would like to share with you: one happened in our Cassini Room just before Christmas where Planetarium staff were undergoing Space School training by Chris Barber of ISSET. Chris showed that when we viewed things on the scale of the Earth-Moon distance, our foothold in space is a trifling fingernail’s breadth away from our home planet. But we need to start somewhere! The image other is when I met a group of students from Alexandria University after I had given them a talk about the International Planetarium Society and what we

did at Armagh Planetarium. Their enthusiasm and keenness was palpable, and I wish that some of our less than enthusiastic school pupils could experience this.

“our foothold in space
is a fingernail’s breadth
away from our home
planet”

Those Egyptian students clearly had grasped that their destiny lay in their own hands. There is little to be gained by sitting back and awaiting random chance to deliver a lucky break, like playing the 14 million-to-one odds of winning

the UK Lottery or X-Factor fame. Much better to create your own luck by taking control of your own destiny.

I also cannot end without taking this opportunity to praise all of the Planetarium staff who work so hard throughout the year to make Astronotes happen, and who produce such a professional product. They are Colin Johnston and Alyson Kerr, aided and abetted by all of our staff contributors, Tracy McConnell, Nigel Farrell and Orla O’Donnell. On behalf of all of the staff at Armagh Planetarium I wish all of our readers in Ireland and around the world a very prosperous New Year for 2009.

2009’s Space Odysseys

By Colin Johnston, Science Communicator

Here are some interesting space and astronomy dates and anniversaries for 2009 to note in your diary. As always remember spacecraft launch dates are subject to sudden change!

2009 will be the International Year of Astronomy sponsored by UNESCO and the International Astronomical Union. The Year commemorates the 400th anniversary of the first recorded astronomical observations with a telescope by Galileo Galilei (but see 26 July!) and the publication of



Image Credit: International Year of Astronomy

Say “hi ya” to IYA: by the end of the year millions of people will have a new appreciation of astronomy.

Johannes Kepler’s *Astronomia Nova*, the first work to discuss planetary motions in terms of physics rather than mysticism. Armagh Planetarium will be sponsoring and hosting IYA events throughout 2009.

4 January: Earth is at perihelion (the closest point to the Sun)

26 January: An annular eclipse of the Sun will be visible from a wide track crossing the Indian Ocean and western Indonesia. A partial eclipse will be seen within the much larger path of the Moon’s penumbral shadow, which includes the southern third of Africa, Madagascar, most of Australia, southeast India, Southeast Asia and Indonesia.

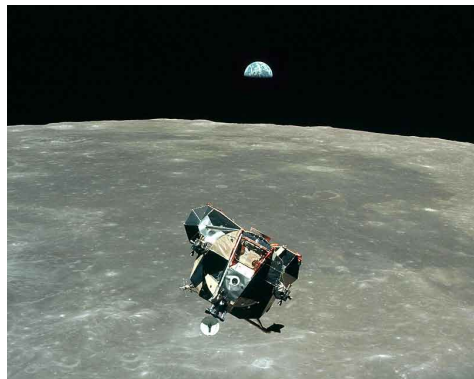
February: This month the Dawn spacecraft will perform a flyby of Mars on its way to the asteroid Vesta.

9 February: An eclipse of the Moon will be visible from western North America, the Pacific Ocean, Asia and eastern Europe and Africa.

14 February: On this day in 1989 the first Global Positioning System satellite was launched. Since then satellite navigation has become indispensable and ubiquitous.

26 March: On this day in 1859, French astronomer Edmond Modeste Lescarbault observed what he believed to be a transiting planet inside Mercury's orbit. By January 1860 this phantom planet had been named Vulcan and was occasionally observed through the remainder of the nineteenth century.

4 April: The Lunar Reconnaissance Orbiter (LRO) and Lunar Crater Observation and Sensing Satellite (LCROSS) will be launched together on this day. Both probes will orbit the Moon. LRO is intended to locate sites for future human missions to the Moon. LCROSS is to observe the probes' booster impacting the Moon's surface. This mission was to have been launched last year but was postponed.



Earthrise with Eagle Apollo 11's ascent stage photographed in lunar orbit by Michael Collins in July 1969.

10 April: Within four weeks after this date, ESA's Planck and Herschel astronomical satellites should be launched together on an Ariane 5. Alert readers may have noticed that this is the third year that I have reported the immanent launch of these satellites!

18 May: On this day in 1969 Apollo 10 blasted off for the last practice mission before the actual moonlanding. The mission's lunar module descended to within 16km above the Moon's surface and on their return journey astronauts Thomas Stafford, John Young and Eugene Cernan became the fastest moving humans ever (a record which still stands) when their spacecraft achieved the speed of 11.08 km/s (24 791 mph)

4 July: Earth is at aphelion (the furthest point

from the Sun).

7 July: A lunar eclipse will be visible to observers in the western USA and Canada, Pacific Ocean, Australia and East Asia.

11 July: In 1979, Skylab, NASA's first space station, burned up during re-entry over western Australia on this day,

20 July: Forty years ago today Apollo 11's lunar module Eagle successfully carried Armstrong and Aldrin to Tranquillity Base. Throughout 2009 Astronotes will be celebrating Project Apollo.

21-22 July: A total eclipse of the Sun will be visible from India, Burma, China and the Pacific Ocean.

26 July: Four hundred years ago today, English astronomer Thomas Harriot (1560-1621) observed the Moon through a telescope and drew what he saw. These observations actually predate those of Gallileo who is usually thought of as the first telescopic astronomer.

6-7 August: An eclipse of the Moon will be visible from western Asia, Africa, Europe and most of the Americas.

26 August: Voyager 2 flew past Neptune on this day in 1989. Its observations of Neptune and its moons, notably giant Triton are unlikely to be matched for decades to come.

28 August: 150 years ago today the most powerful solar storm ever recorded began. Aurorae were seen as far south as Rome. During peak intensity on September 1 - 2 telegraph systems all over Europe and North America were shorted out by the induced currents.

1 September: Saturn welcomed its first terrestrial visitor on this day in 1979 when Pioneer 11 flew by the ringed planet.

14 September: The USSR's Luna 2 became the first man-made object to reach the Moon when it was deliberately crashed into our satellite. The probe was smashed on impact between the craters Archimedes and Autolycus but was designed to scatter pennants bearing Soviet emblems around the crash site. Probably one

day these will be recovered by future missions to be flogged on Ebay.

23 September: On this day in 1999, NASA's Mars Climate Observer spacecraft was lost. Embarrassingly the cause proved to a failure to convert metric units into imperial units. The project cost \$327.6 million.

29 September 29: NASA's MESSENGER spacecraft will make its final flyby of Mercury, decreasing velocity enough for an orbital capture in 2011.

October: The first Russian interplanetary probe in more than a decade, Phobos-Grunt, should be launched this month together with the first Chinese planetary mission, Yinghuo-1. An ambitious project, Phobos-Grunt is an unmanned lander that will study the Martian moon Phobos and return a soil sample to Earth. Yinghuo-1 will photograph Mars and study the planet's weak magnetic field.

7 October: 1959 was a good year for Soviet Moon probes, on this day Luna 3 returned the first ever images of the Moon's far side. By modern standards the images it returned were very low resolution but were clear enough to identify prominent features.

14 November: 1969 was a good year for manned missions to the Moon. On this date Apollo 12 was launched. Astronauts Charles Conrad (who preferred to be called Pete) and Alan Bean



Image Credit: Wikimedia.org

The British Galileo As well as an astronomer, Thomas Harriot was an explorer, physicist, mathematician, naval architect and linguist. There is a crater on the farside of the Moon named in his honour.

landed in the Ocean of Storms and stayed for 31.5 hours before safely returning to Earth with the Command Module Pilot Richard Gordon.

3 December: 1999 was a bad year for American Mars probes. On this day that year the Mars Polar Lander was lost. Its fate is still unknown.

31 December: A partial eclipse of the Moon will be seen from Australasia, Asia, Africa, Europe, northern Canada, Alaska, eastern Brazil and the Indian and Atlantic Oceans.

First Images of Exoplanets

By Alyson Kerr, Education Support Officer

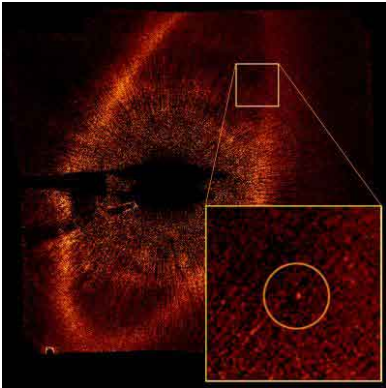
“...Then felt I like some watcher of the skies
When a new planet swims into his ken...”

On First Looking into Chapman's Homer, John Keats (1795-1821)

The past couple of months have been a busy time for astronomers searching for exoplanets. Since 1995 over 300 exoplanets have been discovered orbiting around neighbouring stars. Despite not being able to image them, astronomers used various techniques to prove their

existence. Astronomers look for a star's 'wobble' caused by the pull of the planets gravity as it orbits or they watch for it dimming at regular intervals therefore suggesting that there may be a planetary body orbiting the star and periodically blocking its light.

It was virtually impossible to image one of these planets. Astronomers faced not only resistance from the turbulent atmosphere of the Earth but the planet would be hidden in the glare of the light from its star. Only in November 2008 did we receive the first direct and unambiguous images



A planet revealed the first images of an exoplanet that orbits the star Fomalhaut in the southern constellation of Piscus Austrinus. The faint glow is caused by the heat from its formation.

of an exoplanet. Direct images are essential for us to determine whether habitable conditions are a possibility and the new images are a valuable step towards this.

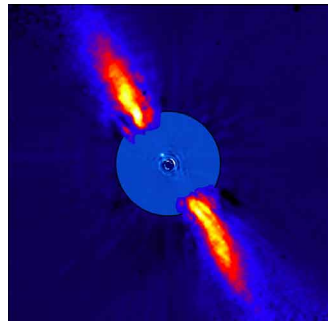
Astronomer Paul Kalas has been working with the Hubble Space Telescope for nearly eight years taking repeated pictures of a nearby star. He has been rewarded with the first visible-light snapshot of a planet outside of our solar system, an event that many have been waiting for. This planet is located around a star 25 light years (7.7 parsecs) from Earth called Fomalhaut. Indications of its presence were revealed due to the planet's interference with the ring of gas and dust surrounding the star. The planet is estimated to be similar in size to Jupiter, our own Solar System's largest planets. Fomalhaut b, as it is formally known, orbits the star every 872 years at a distance about four times that between Neptune and the Sun or a distance of 119 AU. This is an extraordinary discovery, especially as Paul Kalas has proved the existence of a planet he has known to exist since 2005. His hard work has certainly paid off.

Not only have we been lucky to see one exoplanet orbiting a star, but in November we also received the first images of a multi-planet solar system. Three planets orbit the star HR8799, which is 140 light years (42.9 parsecs) away and 1.5 times the size of our own Sun. The planets are between seven and ten times the mass of

Jupiter and get successively smaller moving out from their star. The star is still very young, a mere 100 million years old. Young stars are becoming valuable research objects. As they are early in their life cycle they retain more material and debris, creating large planets at wider separa-

“As young stars are early in their life cycle they retain more material and debris creating large planets at wider separations that are easier to detect.”

tions that are easier to detect. Another planet to be imaged around a ‘baby’ star is Pictoris b. Beta Pictoris is a star located 70 light years (21.5 parsecs) away and only 12 million years old. A team of French astronomers, using the Very Large Telescope have located an object orbiting it. They are still trying to determine if this object is without doubt a planet but so far the indications are positive. If it is a planet then it will be the closest exoplanet to its star yet imaged. Pictoris b is as far from its star as Saturn is from our sun and approximately 8 times the size of Jupiter. Once again, this planet was discovered due to its interference with the star's debris disc and the planet's faint glow due to its recent formation.



Pictoris b As young stars are early in their life cycle they retain more material and debris creating large planets at wider separations that are easier to detect.’.

These recent development will pave the way for further and progressive research into exoplanets, their existence and maybe one day, their habitability. In the next few months we are sure to obtain more images of these far away worlds

and they may even help us to understand the evolution of our own planet and solar system. Hopefully in the coming months I will be able to update you on these developments.

Canada's Falling Star

By Orla O'Donnell, Education Support Officer

On the 20 November 2008 at 5:30pm Mountain Standard Time a brilliant fireball lit up the skies over Canada. Eyewitness reports from the province of Alberta stated the burning ball of fire was lower than an aeroplane. Some initial reports suggested that the fireball was the remains of a Russian rocket burning up in the atmosphere but this suggestion was quickly squashed. The image of the fireball falling was caught on security cameras and by passers-by who happened to have a camera on hand. This was enough evidence for scientists to believe that the most likely explanation of the fireball was in fact a meteor.



Williamite Meteorite this piece of heavenly space junk has been worshipped by the Native Americans for centuries

Meteors have long been thought to be signs from the heavens and in many ancient cultures a falling meteor was referred to as a 'falling star', to primitive observers of the sky at night a meteor was literally a star dropping out of the heavens. Other cultures interpreted a meteor differently, in Europe they were seen as a person's earthly soul leaving their body and when after witnessing one in the night skies observers would be heard saying 'God be with you'. After meteorites have fallen many cultures have built shrines to worship these pieces of natural space junk which to them were other worldly objects to be revered. In the United States, there is a large Willamette meteorite housed in the American Natural History Museum in New York City. The Meteorite is massive, weighing over 15 tonnes and was said to be worshipped by a Native American tribe who would dip their spears in to the water which collected in the large cavities of the meteorite before going on a hunting expedition.

“many cultures have built shrines to worship these pieces of natural space junk”

Meteors occur when a meteoroid, which is a piece of rock or iron from the outer part of our Solar System, enters Earth's atmosphere. A combination of friction with the air and the wall of compressed air which piles up in front heats up the meteoroid and it begins to glow and break up creating a trail of debris that resembles a tail. In this state the meteoroid is now defined as a meteor and if it survives and hits the earth it is called a meteorite. As most meteors disintegrate before reaching the Earth's surface (only five or

six meteorites fall and are found per year) it was therefore of great importance to the Canadian scientists to try and find any remains of the Canadian meteor.

Just seven days after the Canadian meteor fell scientists were able to locate fragments of the meteorite. Planetary scientist Dr. Alan Hildebrand from the University of Calgary and graduate student Ellen Milley were able to lead eager reporters to the site of the meteorite's impact. The meteorite was found in an area called Buzzard Coulee which is 40km (25 miles) from the town of Llodminster on the Alberta- Saskatchewan border in Western Canada. The meteoroid was calculated to have weighed ten tons before it exploded in the skies over Canada. This remote region is strewn with meteoroid material that appears to be iron in nature.

A few days after the discovery of the meteorite by Dr Hildebrand more fragments of the massive meteor were discovered including a piece that is roughly the size of a human head and weighs 13 kg (2 stone). The fireball, which was responsible for all this debris, has been named the Buzzard Coulee Meteor after the remote area in which the majority of the fragments were found. Dr Hildebrand who is leading the search for the meteorite fragment has estimated that there could be thousands of fragments as many as



Image Credit: Wikipedia

Head meteorite luckily this didn't fall on someone's head!

2000 per hectare. So far over 24 pieces of meteoroid material have been found and the search continues. The University of Calgary have been joined by the Canadian Space Agency as well as many members of the public who are eager to find a piece of the meteorite for themselves. A father and son discovered the head-sized piece and it is now the property of the landowner on whose land it fell. Meteorites are a key tool in planetary research and can answer questions about the creation of the solar system. Whether you are an amateur or professional stargazer there is no denying the power and majesty of the image of a meteor falling.

Sugar in Space

By Nigel Farrell, Education Support Officer

Scientists probing a distant part of our galaxy within which it is thought habitable planets could exist have discovered an organic sugar molecule. A multinational team of scientists using the Institute for Radio Astronomy in the Millimetre Range (IRAM) radio telescope, located in the French Alps, discovered the molecule in a huge star forming region of space some 26 000 light years (8000 parsecs) from Earth. The molecule known as glycolaldehyde is a simple sugar and is thought to be one of the most basic compo-

nents of life. Although glycolaldehyde has been discovered in space before, close to the centre of our galaxy, this new research represents an important breakthrough. Dr Serena Viti from University College London said "it is the first time glycolaldehyde, a basic sugar, has been detected near a star-forming region where planets that could potentially harbour life may exist".

So, why all the fuss over this tiny particle? Well, put together with propenal, another organic compound, they can form ribose, which in turn is used to make ribonucleic acid (RNA), which

is used to make deoxyribonucleic acid (DNA), which is used to make you. Thus, glycolaldehyde is one of the most essential building blocks of life, and to find it in space is a pretty exciting discovery especially for those scientists concerned with the search for alien life.

“The discovery ... will provide incredibly useful information in our search for alien life”

Glycolaldehyde had been discovered in space as far back as 2000, particularly in hot galactic core regions, close to the centre of our Milky Way. However, to find it in this remote region, far from the galactic core, which scientists have designated G31.41+0.31 implies that the production of this key ingredient could be commonplace throughout the galaxy. This, added Dr. Viti, “is good news in our search for alien life, because a wide spread of the molecule improves the chances of its existing alongside other molecules vital to life, and in regions where Earth-like planets may exist”.

Long range searches like these are obviously very different from those carried out closer to home, such as, recent surveys carried out on Mars which searched out water ice and methane on the planet’s surface. As yet scientists still cannot quite make out specific structures in far flung parts of the galaxy. However, thanks largely to advances in quantum mechanics, Materials can be identified across the Milky Way just from the light we receive, therefore, scientists are no longer confined to just the visual spectrum. Every chemical has its own unique light signature, which comes from photons jumping between

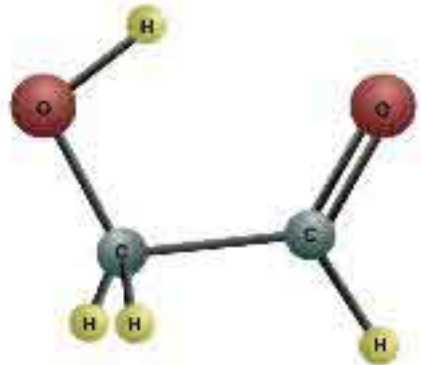


Image Credit: NASA

Sugar molecule the discovery of complex organic molecules in deep space indicates that the ingredients of life are found throughout the Universe.

the different electron energy levels in its atoms. A good example of this identification process is the glycolaldehyde molecule discovered in this recent research. It was recognized by its infra-red emissions, and was found in a swirl of gas and dust around a collection of stars. “Possibly, this material is actually rotating around the stars, which may imply that it’s a disk and that’s where planets may form,” said Dr Viti.

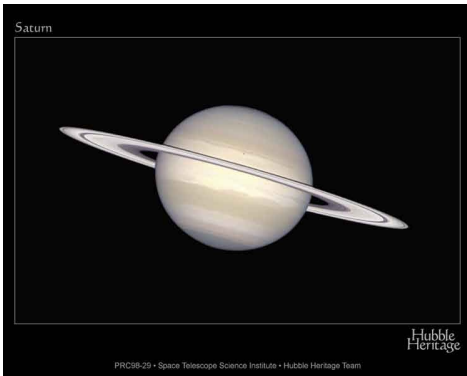
Professor Keith Mason, Chief Executive of the UK’s Science and Technology Facilities Council (STFC), said that “the discovery of an organic sugar molecule in a star-forming region of space is very exciting and will provide incredibly useful information in our search for alien life. Research like this, combined with the vast array of other astronomical projects involving UK researchers, is continually expanding our knowledge of the Universe and keeping the UK at the forefront of astronomy.”

The Sky in January

By Tracy McConnell, Education Support Officer

Welcome back to the “Night Sky Guide” for January 2009. The biggest perk for observ-

ing the sky at this time of year is the long dark nights, however, I would like to remind you that you will have the cold to attend with, so please



Natural Saturn This pale image of Saturn is the result of Hubble Heritage Team's subtle use of colour to attempt to show a more natural realistic view of Saturn.

remember to wrap up warm and have a hot drink handy to fend off the cold. Please consider that the general guide presented here is based on the stellar positions at 11:00pm on 15 January, and while the stars don't change much from day to day, their relative positions will move across the sky throughout the night.

As the sun is setting at around 6pm the bright wandering star in the south west half way up the sky is clearly visible. This is our stunning sister planet, Venus, named for the Roman goddess of fertility, beauty and love. She is also synonymous with the Greek goddess Aphrodite. Venus will set in the West at 9pm.

“Saturn was the Roman god of agriculture and harvest, and he was the father of Jupiter”

At 10pm in the East, Saturn will be rising. He was the Roman god of agriculture and harvest, and he was the father of Jupiter, who was the king of the gods and is called Zeus by the Greeks. Saturn will travel south west in the southern sky throughout the night in conjunction with the moon.

At 11pm Saturn is just entering one of our Zodiac constellations. Leo, the Lion. In Greek

Mythology, Leo was a savage man-eating lion which was gifted with an impenetrable hide by Hera the Queen of the gods. He was terrorising a village and Hercules came to protect them. Hercules wrestled the lion and strangled it to death, thus saving the villagers. The Constellation of Leo is easily found by looking for a backward question mark in the middle of the eastern sky. This marks the regal head of the lion and its body stretches out behind it like a sphinx lying on its belly.

“Leo was a savage man-eating lion gifted with an impenetrable hide”

You should be able to see the line of Zodiac signs stretch across the southern sky from east to west starting with Leo, Cancer, Gemini, Taurus, Aries and Pisces. These are the same zodiac signs that were visible last month as well. There are several bright constellations this month, Leo being one of them. The next one is found directly south, and is called Orion, the hunter. This constellation contains more bright stars than any other constellation. The body of Orion is a group of stars in the shape of an hourglass. There are three bright stars in a line that represent his belt, then two stars above for his shoulders and two below to mark his knees. The star on the top left that marks one of Orion's shoulders is obviously reddish in colour and is called Betelgeuse. It's the ninth brightest star in the sky and is 1000 times larger than our sun. The bottom right hand star in Orion which marks one of his knees is called Rigel. It's more bluish and is the seventh brightest star in the sky. As Orion is visible for the next few months and has lots of interesting sights to offer, I'll tell you about some of them in next month's article.

Another one of the bright constellations visible right now is Orion's hunting dog Canis Major, the Great Dog. To find Canis Major, follow the line of Orion's Belt downwards towards the horizon. Here you will find the brightest star in the sky. It's called Sirius, the Dog Star, and it's also the brightest star in Canis Major. I covered it in more detail last month.

If you trace a line from right to left across Orion's shoulders and out into space you come to another bright star called Procyon. This is the brightest star in the constellation of Canis Minor, the little dog, and is the eighth brightest star in the sky.

Our next bright constellation is almost directly overhead and facing slightly south. It's called Auriga, the charioteer and is an odd shape, with the brightest stars forming a pentagram shape. One of the stars is also the star at the tip of Taurus's upper horn, so this may help you find this new constellation. Auriga contains a beautiful binary star, and both of the constituent stars are yellow in colour. It's the brightest star in the constellation and sixth brightest in the sky. It's 100 times brighter than our sun and is called Capella which means "Little She Goat". It got its name from Greek Mythology, according to which a little goat named Amalthea helped to feed the infant god Zeus. The Romans called Zeus Jupiter, and a small inner moon of Jupiter is named Amalthea.

The last two bright constellations are in the northern sky and are very familiar circumpolar constellations. Ursa Major, the great bear and Cassiopeia the Queen. Ursa Major is NE and Cassiopeia is NW and both are high in the sky. That covers the most visible patterns at this time



Image Credit: © Matthew Spinelli

The Mighty Hunter You can clearly see the bright stars of his belt and the obvious colour difference between the red star Betelgeuse and the blue star Rigel. The bright red object hanging down from Orion's Belt is a Stellar Nursery called the Orion Nebula.

of year, although with the cold dark nights and a bit of patience there are many more to be seen.

Moon Phases, Jan 2009

Sun 4 Jan	First Quarter
Sun 11 Jan	FULL MOON
Sun 18 Jan	Last Quarter
Mon 26 Jan	NEW MOON

EAAS becomes NIAAS

By Colin Johnston, Science Communicator

On 1 January 2009 the East Antrim Astronomical Society (EAAS) has changed its name to the Northern Ireland Amateur Astronomy Society (NIAAS). The EAAS has long been a fixture on the local amateur astronomy scene.

To celebrate this event the NIAAS held a launch party on 5 January 2009 in Ballyclare High School with both telescopes and members' photographs on display. Guests included Prof. Mark Bailey, Dr David Asher and Dr Miruna Popescu from Armagh Observatory, Pat O'Neill, president of the Irish Astronomical Association (IAA). The special guest and speaker was Dave McDon-

ald, an IFAS Astronomer of the Year and recent discoverer of the first asteroid from Ireland since 1848. The night seems to have been a great success and I was sorry to have not been there.

Societies like the NIAAS are vital for the promotion of astronomy and are an indispensable resource for stargazers who want to meet others to learn about observing techniques and equipment, chat about the wonderful world of astronomy and share their experiences. We wish the re-named Society every success.

You can find out more about the NIAAS at <http://www.niaas.co.uk/>

Image of the Month



(Dec 1) the Moon was approximately 251 400 miles (403 900 km) from Earth, while Venus was nearly 371 times farther away, at 93.2 million miles (149.7 million km). Jupiter was almost 2150 times farther away than our Moon at 540.3 million miles (869 million km).

Both images were created by Dr Miruna Popescu, a post-doc fellow based at Armagh Observatory. Dr Popescu who, as you can see, is a very talented artist, often takes inspiration from astronomy. She

For the first time our image of the month contains two pictures, I simply could not decide between them. They both feature the very beautiful and rare triple conjunction of the crescent Moon Jupiter and Venus observed in the southwestern sky above Armagh at the beginning of December. Conjunctions occur when celestial objects appear close to each other in the sky. Venus and Jupiter, the two brightest planets in our sky, pair up roughly once a year, but such conjunctions often occur too close to the Sun to be observed. The conjunction was especially interesting as Venus was occulted by the Moon, that is to say the Moon passed in front of the 'Evening Star'.

This awe-inspiring display of three celestial objects crowded together was in fact an illusion of perspective, at the time of the conjunction

has published many pictures in books, calendars, Christmas cards and on the internet to see more images go to the Observatory website (<http://star.arm.ac.uk>). (Caption by Nigel Farrell, Education Support Officer)



Image Credit: Both © Miruna Popescu, Armagh Observatory



www.armaghplanet.com

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