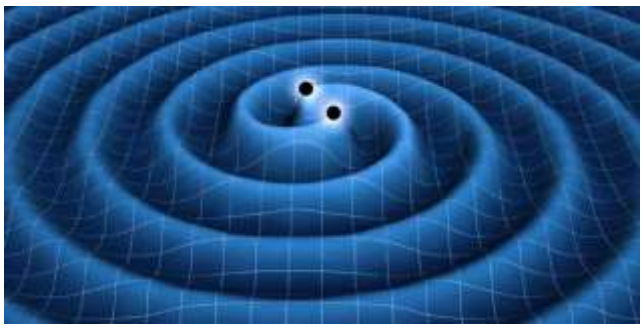
Newsletter March 2019

Next Meeting: **25th March 2019**

Prof Stuart Reid and Dr. Marciela Masso

Gravitational waves

7pm at Prestwick Academy



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President's Word

Once again it is the time of the month, for the newsletter to be sent out to all members, and I would like to take this opportunity to thank all those who have made submissions for this and past newsletters. I'd also like to take this opportunity to thank the Editor, Isabelle for collating all the articles and putting them into a very presentable format. While we are on the subject of thanking people, I would like to thank all the committee members for their tireless work behind the scenes in ensuring the society performs as it should, in particular Angela, who organises all the speakers for the year and who has been recently helping me deal with venue issues. This is on-going, and I'd ask you all for your patience, while we sort the problems out.

I have long been a fan of viewing Bodes Nebula, as the rewards of viewing, reap two very different shaped galaxies. Bodes M81 has just the right tilt to show off its classic spiral shape and M82 gives stunning views of a Cigar shaped galaxy when viewed side on to us here on Earth.

The Cigar Galaxy (M82), a spiral galaxy viewed edge-on, is burning with new stars. They form at a rate ten times faster than the Milky Way and push dust and gas out of the galaxy in a "superwind."
This galaxy is a very typical starburst galaxy giving rise to stars in definite spurts. One starburst occurred 10 million years ago in its nucleus, and another sprang up 5 million years ago in a ring around the galaxy's core. This froth of starbirth drives a so-called *Galatic Superwind;* dust, gas, and radiation that flow out of the galaxy and into intergalactic space.
Recently scientists led by Terry Jay Jones have used the SOFIA airborne observatory (Boeing 747) in the far infrared in an attempt to work out what is happening to the magnetic field within the galaxy. The hot dust within the giant clouds giving birth to the galaxy's stars, are responsible for the light emitted. Dust however, isn't perfectly spherical; the grains tend to be oblong, and they often align with the ambient magnetic field that threads the galaxy. So the emission from these dust grains is *polarized* in a way that tells astronomers which way the magnetic field is pointing.

What Jones's team found was that within 2,000 light-years of the galaxy's center, the wind that charges into intergalactic space carries the galaxy's magnetic field along with it. The polarization in the image above shows that the magnetic field is pretty much vertical in this central region. Outside this region, the magnetic field is horizontal, threading the plane of the galaxy.

The first composite image shows the magnetic fields detected by the "HAWC+ instrument" onboard SOFIA. The second is my own image of the Cigar taken some time ago in visual light.

Wishing you all clear skies and dew-free optics!
Roger Harman

Events

Sunday 5th May 2019, Cars on Campus in Kilmarnock.

We need volunteers. If you are able to help out on this event, please let one of the committee members know. You can bring your own telescope, books or other equipment/material you have got but it is not necessary.

Past event:

I gave a Solar Astronomy talk last Tuesday to the Alzheimer group in Kilmarnock. They thoroughly enjoyed it and asked for me to come back on a sunny day as they would love to do some live observation. I will be delighted to organise that short notice. If you want to be part of it too, let me know. I am probably thinking May or June. A Tuesday afternoon would be a preferred day for them but could be arranged for another day if need be.

Alex's Space

Women in Astronomy

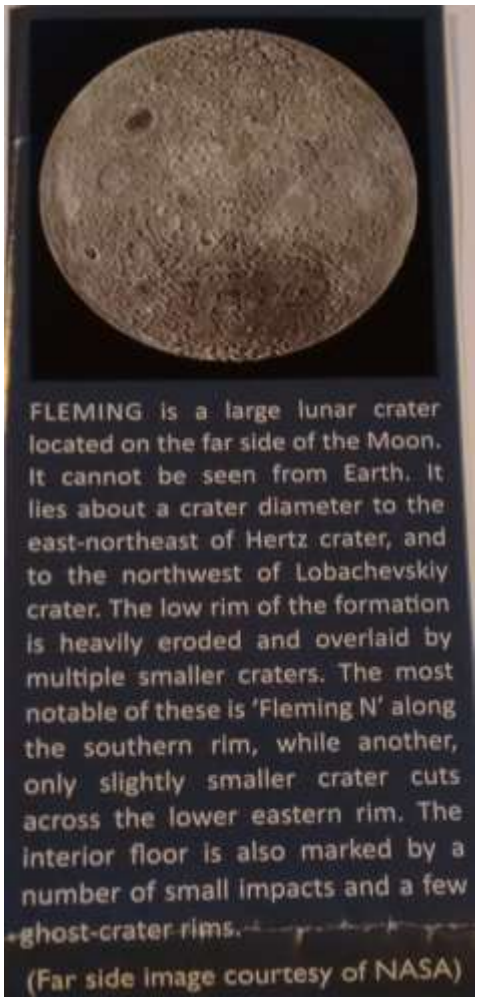
Data Galore!

This is a picture of Margaret Hamilton.

She was NASA's leading software engineer and her "friend" beside her is the Apollo Guidance Coding that she wrote. She left NASA and started her own business – Hamilton Technologies Inc. The company developed the Universal Systems based on her paradigm DBTF (Development Before The Fact). She has published over 130 papers and reports. In November 2016 she was awarded the Presidential Medal for Freedom by President Barak Obama for her work in the development of the on board flight software for NASA's Apollo Moon Mission. A very clever lady!

Here is another clever lady.....this is a picture of Scots born Williamina Fleming (Nee Stevens).

She was one of a group of pioneer female astronomers in the early 1900s and would become the first woman to have a space object named after her. She taught mathematics, and married James Fleming in 1895. They emigrated to the USA and settled in Boston Massachusetts. She was hired by Harvard College observatory doing clerical work and mathematical calculations. She soon became head of a group of women astronomers, their task to perform the complex, mathematical computations that today would be performed by electronic computers. She specialised in analysing spectrum photography. In recognition of her work she had the honour of having a Moon crater named after her. Unfortunately it cannot be seen from Earth as it is on the far side of the Moon, but perhaps one day there may be sightseeing trips from Earth!



FLEMING is a large lunar crater located on the far side of the Moon. It cannot be seen from Earth. It lies about a crater diameter to the east-northeast of Hertz crater, and to the northwest of Lobachevskiy crater. The low rim of the formation is heavily eroded and overlaid by multiple smaller craters. The most notable of these is 'Fleming N' along the southern rim, while another, only slightly smaller crater cuts across the lower eastern rim. The interior floor is also marked by a number of small impacts and a few ghost-crater rims.

(Far side image courtesy of NASA)

And finally.... What type of person would spend a small fortune on a bottle of mineral water?

Spell Evian backwards.

Back next month

Marc's Article

Over the last few months we have been visited by few comets. One surprise was the comet 2018 Y1, discovered by Masayuki Iwamoto on the 20th of December. It is long period comet, following a 1,371 year retrograde orbit, meaning it was moving opposite to the rotational direction to most of the rest of the solar system and it won't be back for a while. Its closest approach to the sun was about 1.3 astronomical units (earth to sun = 1 AU), and because of the way it was moving it seemed to race across the sky. Its closest approach to earth was on February the 12th. I obtained this image on the 10th of February as it passed through Leo. It is a stack of 150 images taken in just under 33 minutes, showing how fast the comet is moving.

Later it crossed into Auriga and I was able to capture it on February 26th.

The comet is the bluish object just to the right of the top centre. By this point its angular motion has slowed sufficiently that it hasn't been unduly elongated. From left to right, Auriga's three magnificent open clusters are: M37, the January Salt and Pepper Cluster; M36, the Pinwheel Cluster; and M38, the Starfish Cluster.

Lastly, I obtained this one as it was moving away from the clusters on March the 2nd.

M38 is at the top left, IC 417, the Spider Nebula is at the bottom left, the comet is at right, just above C31, the Flaming Star Nebula.

Deep Sky in Black and White

The Rosetta Nebula taken at the end of January.

Lunar Geology Through Colour

Image taken on the 17th of March.

All three images were made from the same photograph, showing three different aspects of the moon. The first one on the left shows the moon as it typically looks with minimal processing. To bring out as much detail as possible the image in the centre has had its contrast stretched to near breaking point. Finally, the colour saturation has been pushed to an extreme in the right-hand image, bringing out subtle colour differences in the moon's surface geology.

The white or off-white areas in the image make up the lunar highlands, whereas the darker blue and reddish basins are the lunar seas. The highlands are part of the original surface of the moon and are made of lighter rock which separated from denser material as the moon solidified early in its history, roughly between 4.1 and 4.4 billion years ago. It is composed largely of anorthosite (feldspar), and contains elements like silicon, calcium and aluminium. The lunar seas, by contrast, are made of denser basalt that flooded onto the surface, mainly between 3 and 3.5 billion years ago. These magmas erupted after being heated by a long period of radioactive decay. The variations in colour are due to abundances of various metals, the dark blue is from the presence of titanium, whereas, the reddish areas result from concentrations of iron.

Nick's Article

Making a colour astronomical photograph

The region around the nebula and star cluster NGC 3605

What does the picture show?

The spiral arms are waves of more densely packed stars and gas passing through a galaxy. Here the wave is passing through the Carina/Sagittarius arm triggering a wave of star formation, which is making a several million year journey from right to left in the picture - now having reached about halfway.

The right side shows a bluish haze of dust lit up by the hot young stars recently formed. There are also many different shaped nebulae – loops, patches and strands of glowing hydrogen gas fluorescing from ultra violet light from stars or star clusters in them or near them. NGC 3590 is the cluster just below the centre with the loops (of unknown origin) of glowing hydrogen. The central star cluster contains many hot, young giant stars.

A black and white picture of the nebula NGC 3905

This is a *luminance* image (uses all the light from the object)

This luminance image is made up of three 10 minute exposures combined into one (stacked) by software which mathematically sums the brightness of each pixel in the image and does some statistical processing of them as well to maximize the contrast with the background and minimize random noise.

Now take photographs through different colour filters

RED

GREEN

A photographic colour image is made up of a red, a green and a blue image superimposed on each other. Most astronomical images combine images taken through different coloured filters. The images are black and white positive images made by stacking together several exposures for each filter (to get a better image).These images taken through a red (left) and a green (right) filter show the different appearances of the same object in different coloured light

Narrow band filters only allow specific wavelengths of light to pass through. The image on the LEFT was taken through a hydrogen alpha filter. This only lets through light at the wavelength of the red emission line (the hydrogen alpha line) in the spectrum of hydrogen. This greatly increases the visibility and contrast of gaseous nebulae which consist mainly of hydrogen. Compare the H alpha image with the image taken through an ordinary red filter (RIGHT) to see how effective this is.

H alpha filter

RED filter

Green filter

Red filter

Blue filter

H alpha filter

These pictures show the nebula and it surroundings taken through the different colour filters. They show how the various filters highlight different objects. The red filter and still more the H alpha filter highlight the gaseous nebulae, while the blue filter highlights the interstellar dust, which is shines with the reflected light of the hot blue young stars. The green filter emphasizes the stars. Image processing programs convert these images into a single colour picture by taking each pixel from, for example, the red filter image and setting its brightness as the brightness of the red pixel for that point. The same is done for each colour filter so at each point there is a set of the red, green and blue pixels which will blend together to show the natural colour for that point. The luminance image is then combined with the colour image to maximize the detail.

Especially using narrowband filters, the actual colours displayed can be changed to give a false colour image, which can often highlight particular features. Many Hubble images are in false colour.

Final picture combining the colour and luminance images

★★★

Library

Open for business!

THE LIBRARY IS A RESOURCE FOR MEMBERS -PLEASE SUPPORT IT AND MAKE USE OF IT

The Library list is also available on the website under "links" and can be downloaded

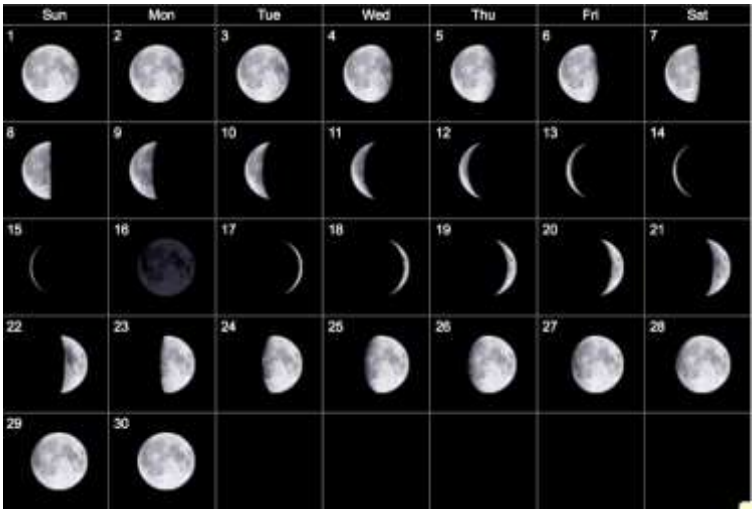
The library is now full up - if you would like to obtain a list or borrow an item

– contact Alex at the next meeting or give him a call on 01563 520887.

Unfortunately Alex does not have email, however messages via library@ayrastro.com will reach him the old fashioned way after a short delay but please contact him directly if at all possible.

THE LIBRARY IS WAITING FOR YOUR CALL!! There are a lot of interesting items to borrow

Moon phases April 2019



And finally…. ☺