# SPACEWATCH

the newsletter of the Abingdon Astronomical Society


## 14th January 2013

**Prof. John Miller**
**(University of Oxford)**

**‘Gravitational Wave Astronomy’**

Happy New Year! The year has already got off to a good start with a successful observing evening and the Stargazing Live event, jointly held with Oxford University’s Astrophysics Dept on Saturday. When we arrived about 7.30pm we were visitors number 982 and 983. An hour later people were still queuing down the stairs waiting to look at Jupiter through a telescope from the roof garden.

Tonight John Miller, visiting professor at the University of Oxford’s Dept of Astrophysics, has come to talk to us about Gravitational Waves and all the astronomy you can do with them, or at least will be able to do with them, once we’ve detected any!

## THE NIGHT SKY THIS MONTH

**by Bob Dryden**

**Mercury:** As this session starts Mercury is just ending a morning apparition, reaching superior conjunction on 18th January. By the end of the month the planet will be on view again in the evening sky when it will set about 45 minutes after the Sun. Mercury reaches greatest eastern elongation on 16th February when it will be 18° from the Sun, and setting about an hour after it. On the 16th Mercury will shine at magnitude -0.4, so once the Sun has gone, the planet will be an easy naked eye object very low in the west. Prior to that, Mercury will be slightly brighter but also slightly lower down in the bright twilight. On the evening of the 8th February Mercury will be just to the right of Mars which sounds like it would be a grand sight. However, Mars is quite faint at magnitude +1.2 and will we very difficult to see against the bright sky (you will need a telescope to stand any chance of finding it). The evening of 11th February has the crescent Moon just to the right of Mercury which should be an excellent sight, especially as the planet will be a bright magnitude -0.9 that night.

**Venus:** While still on view just before dawn, Venus is now rising barely an hour before Sun. Being a very bright magnitude -3.8 enables you to easily see the planet without optical aid even though it is so low. However, by mid-February Venus rises just 20 minutes before the Sun so this session is your last chance to see it this apparition. With a phase of 98%, the telescopic view of Venus is not great and it will certainly not be helped by the low altitude.

**Mars:** As already mentioned regarding its proximity to Mercury, Mars is very low in the evening sky at sunset and to all intents and purposes out of view.

**Jupiter:** The king of planets reigns supreme in the evening sky at the moment. It is now well placed between the Hyades and Pleiades in Taurus and is already 30° high at sunset in January (by mid-February it will be 50° high at sunset). This means Jupiter quickly reaches an altitude where telescopic views become steady and clear. Shining at magnitude -2.7, you cannot miss Jupiter as it is easily the brightest 'star' in the sky at the moment. On 21st January a bright gibbous Moon will be just to the right of Jupiter while the next night (22nd) the Moon, Jupiter, and the bright star Aldebaran will form a nice triangle.

**Saturn:** In January Saturn does not rise until around 02.00 UT and so remains a morning object. Currently in the constellation of Libra, Saturn does not get very high even when in the south. 25° above the horizon is about the best you can hope for now so telescopic views are always going to be affected by our atmosphere. However, the rings continue to open up, reaching 19.4° by mid-February, so your telescope will still reveal them quite easily. By February the planet rises around midnight, and by dawn, 7 hours later, it is starting to set in the south west so it will not be too long now before the planet moves into the evening sky. On the 3rd February a last quarter Moon will be just to the right of Saturn if you need a guide in finding the planet. Saturn is shining at magnitude +0.6 so is an easy naked eye object.

**Uranus & Neptune:** Uranus remains on view in Pisces as the night begins. By February the planet is still above the horizon for about 4 hours after sunset so you have plenty of time to hunt it down. Currently at magnitude +5.7 you will need some binoculars and a finder chart to find it.

Neptune is much lower (in Aquarius) and fainter (magnitude +7.8) than Uranus. In January you will still have a couple of hours after sunset to find it but Neptune will probably be too low and deep in the evening twilight by mid-February.

**Comets:** There is only one comet predicted to be above 10th magnitude visible from the UK this session and that is our old friend C/2012 K5 LINEAR. The comet is fading fast now, going from 9th magnitude in mid-January to 12th magnitude by mid-February so you will have to be quick if you want to find it. K5 is crossing Taurus in early January and crosses into Eridanus on 16th January. The area you will need to look in is just to the right of Orion so the comet is nicely placed in the evening sky even if it is not very bright.

**Asteroids:** Three asteroids are brighter than 9th magnitude, making them targets for binoculars.

**1 Ceres** is a nice bright (for binoculars anyway) magnitude +7.4 in January but is fading and reaches magnitude +8.0 by mid-February.

**4 Vesta** is even brighter at magnitude +7.1 but it too is fading, reaching +7.7 by February.

Both these asteroids are in Taurus, Ceres close to the bright magnitude +1.7 star beta Taurus while Vesta is close to the Hyades.

Meanwhile, **9 Metis** is slightly fainter at magnitude +8.7 in January, close to the Auriga/Gemini border. It to is fading and it reaches +9.7 magnitude by mid-February by which time you will need very good binoculars and a dark sky to see it.

All three asteroids are in the evening sky so this is a good chance to track them down.

## MOON PHASES:

New: 11th Jan.; First Qtr: 18th Jan.; Full: 27th Jan.; Last Qtr: 3rd Feb.; New: 10th Feb.

## LAST MONTH'S MEETING

**by Gwyneth Hueter**

Last month's talk December 2012 was given by Prof Christian Knigge from the University of Southampton – not "Cataclysmic Variables" as in the programme, but "Hubble Highlights" (which may have been a lot of pretty pictures but we got a lot of science.)

The Hubble Telescope was conceived by US Congress in 1977 and was taken into space by the Discovery Shuttle in 1990. It was expected to have a lifetime of twenty years but it is due to battle on for at least another two years in spite of its well-documented eyesight, gyroscope and funding problems. Its mirror is 2.4m wide, it weighs 11.6 tonnes and is 13.1m in length.

At visual wavelengths its resolution is still ten times better than the best ground based telescopes because it does not have to look through our atmosphere. At UV wavelengths it is even better, as we don't get much UV at ground level.

Pretty pictures and science:

The nebula M16 ("Pillars of Creation") and Orion Nebula are star factories and evidence tells us that protoplanetary discs are quite common around young stars.

In planetary nebulae, Hubble picks up lots of symmetry and concentric rings round the stellar remnant.

Large globular clusters are incredibly dense, up to one million stars. Computer simulations show star collisions can happen, causing single large stars that do not move very fast. These are the 'blue stragglers' ('collision products'). As expected, the progenitor stars are likely to be binaries. Blue stragglers can also be the result of mass transfer in binaries which get close together.

On the wider scale, Hubble was the first telescope that enabled us to see what the central engines in galaxies and the host galaxies round quasars are. Ground-based scopes could only see the super-bright quasar cores.

NGC 4261 has a central black hole with an accretion disc. The Milky Way gives us the best evidence for a black hole, with a mass of three million solar masses, judging by how quickly the stars are orbiting it (the black hole).

The relative brightness of supernovae in distant galaxies enable us to see that the universe is expanding and that the expansion is speeding up. This implies the existence of dark energy, which pervades the universe. Einstein suspected its existence, called it the 'cosmological constant' and thought it was silly!

When you look at the evidence, 75% of the universe is dark energy, 21% is dark matter, and only 4% is normal matter.

NASA Space Place

## THE ART OF SPACE IMAGERY

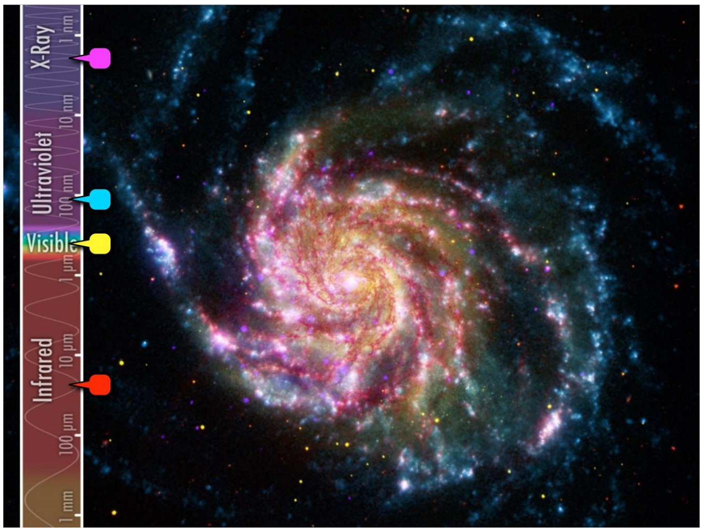
by Diane K. Fisher

When you see spectacular space images taken in infrared light by the Spitzer Space Telescope and other non-visible-light telescopes, you may wonder where those beautiful colors came from? After all, if the telescopes were recording infrared or ultraviolet light, we wouldn't see anything at all. So are the images "colorized" or "false colored"?

No, not really. The colors are translated. Just as a foreign language can be translated into our native language, an image made with light that falls outside the range of our seeing can be "translated" into colors we can see. Scientists process these images so they can not only see them, but they can also tease out all sorts of information the light can reveal. For example, wisely done color translation can reveal relative temperatures of stars, dust, and gas in the images, and show fine structural details of galaxies and nebulae.

Spitzer's Infrared Array Camera (IRAC), for example, is a four-channel camera, meaning that it has four different detector arrays, each measuring light at one particular wavelength. Each image from each detector array resembles a grayscale image, because the entire detector array is responding to only one wavelength of light. However, the relative brightness will vary across the array.

So, starting with one detector array, the first step is to determine what is the brightest thing and the darkest thing in the image. Software is used to pick out this dynamic range and to re-compute the value of each pixel. This process produces a grey-scale image. At the end of this process, for Spitzer, we will have four grayscale images, one for each for the four IRAC detectors.




*This image of M101 combines images from four different telescopes, each detecting a different part of the spectrum. Red indicates infrared information from Spitzer's 24-micron detector, and shows the cool dust in the galaxy. Yellow shows the visible starlight from the Hubble telescope. Cyan is ultraviolet light from the Galaxy Evolution Explorer space telescope, which shows the hottest and youngest stars. And magenta is X-ray energy detected by the Chandra X-ray Observatory, indicating incredibly hot activity, like accretion around black holes.*

Matter of different temperatures emit different wavelengths of light. A cool object emits longer wavelengths (lower energies) of light than a warmer object. So, for each scene, we will see four grayscale images, each of them different.

Normally, the three primary colors are assigned to these gray-scale images based on the order they appear in the spectrum, with blue assigned to the shortest wavelength, and red to the longest. In the case of Spitzer, with four wavelengths to represent, a secondary color is chosen, such as yellow. So images that combine all four of the IRAC's infrared detectors are remapped into red, yellow, green, and blue wavelengths in the visible part of the spectrum.

Download a new Spitzer poster of the center of the Milky Way. On the back is a more complete and colorfully-illustrated explanation of the "art of space imagery." Go to spaceplace.nasa.gov/posters/#milky-way.

## FURTHER DISCUSSION

Why not take a look at our new website? Ian has been working hard over the summer to update the website and make it a little more interactive. It's at the same address: www.abingdonastro.org.uk .

If you are not already on our internet mailing list, then why not log on to YahooGroups. The list is called 'abingdonas'. Members use the list to alert each other about celestial events and to chat about amateur astronomy. The list is quite active, with several messages most weeks. To read through previous messages click on: http://groups.yahoo.com/group/abingdonas/ .

To join the abingdonas list, please go to http://www.yahoogroups.com . You can also unsubscribe from the list here.

To post messages to the list, please send them to abingdonas@yahoogroups.com . Please note that you will need to sign up with a YahooID if you do not already have one. You can do this on the above page.

Further information about the mailing list can be found on the abingdonas webpage at : http://groups.yahoo.com/group/abingdonas/ .

Further discussion on astronomy and many other topics takes place at the Spread Eagle pub in Northcourt Road after the main meetings. You are most welcome to join us.

## DATES FOR YOUR DIARY

**21st Jan.** 8pm Beginners' Meeting in the Perry Room.

**4th-6th Feb.** 8pm (first clear night) Observing evening at Britwell Salome. Ring Ian on 07557 373401 to confirm on the night.

**11th Feb.** 8pm Talk by Dr Allan Chapman (Univ. Oxford) "Johannes Hevelius 1611-1679: Observer of the Moon"

The editor of "SpaceWatch" is Andrew Ramsey, who would very much appreciate your stories & contributions. Please send any news, observations, photos, etc. to:

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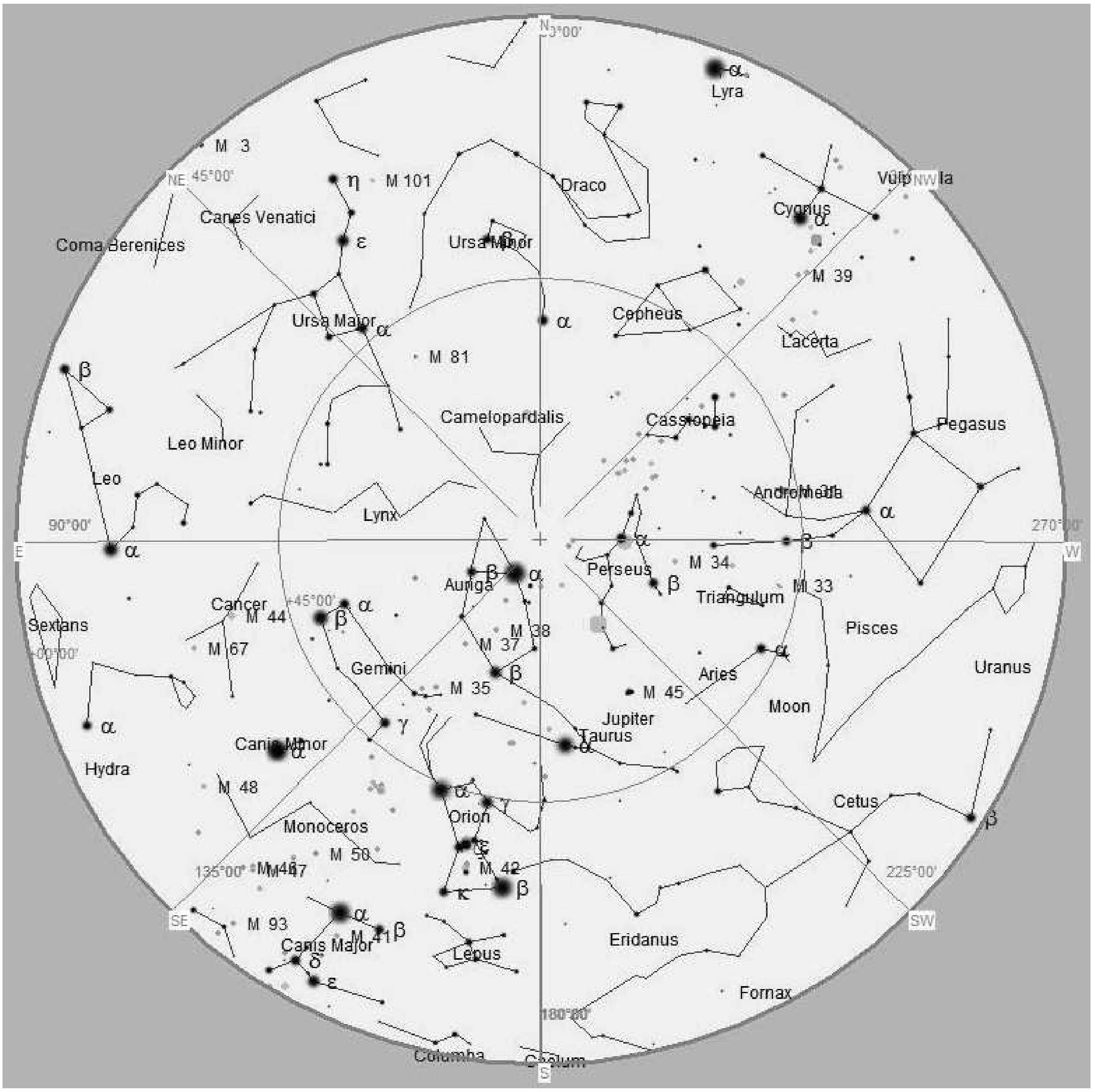
## STAR CHART




### The Night Sky at 9pm (GMT) next Saturday (19th Jan.)

Orion dominates the south. Follow the line of the belt up and to the right to find both Jupiter and the red star Aldebaran, the eye of Taurus, the Bull. Orion's belt points left and down to Sirius, the brightest star in the night sky. Sirius is only 8.5 light-years away and is a binary star. We only see the large component, SiriusA, but there is a small white dwarf orbiting this known as Sirius B. Sirius A is actually about twice as massive as and 25 times brighter than our Sun.

Higher up, almost overhead is Capella, the brightest star in Auriga, the Charioteer. Capella is in fact four stars in two binary pairs, one pair of large G-type stars like our Sun though larger, and a pair of red dwarves, each pair in orbit about the other. The system is about 42 light-years away.