SPACEWATCH

the newsletter of the Abingdon Astronomical Society

13th December 2004

Prof. Mike Edmunds – Cardiff University

"Sir Isaac Newton Remembers"

Make the most of the long nights in December. From the 21st, the nights will again begin to get shorter, as the Earth passes the winter solstice. Let's hope for some cloud-free nights over the next few weeks of the festive season. I hope you all get the eyepieces, astronomy books or filters you asked Santa for.

THE NIGHT SKY THIS MONTH

by Bob Dryden

The Planets:

Sun, Moon & Earth: The Sun reaches its lowest declination point on Dec 21st at 12hr 42min. In other words, this is the time of the winter solstice, and we have the shortest day and the longest night. At this time the Sun is in Sagittarius at a declination of -23.5 degrees. On January 2nd the Earth is at its closest to the Sun (I'm sure that will be a comfort to know if it is a freezing day) while on Jan 10th the Moon is the closest it will come to Earth during 2005.

Planets: Saturn rises at a more favourable time of the evening now and it climbs high in the sky as it is in the constellation of Gemini. The rings are still wide open, although starting to close slowly as the next few years go by. The planet is still just below Castor and Pollux making it easy to find. Jupiter still does not rise until later in the night as it is in Virgo now. Spring will be a better (or at least, more convenient) time to see it. Three planets are in the morning sky, but they tend to be low in the south east and a bit difficult to see. Venus is still there, bright but getting lower as it moves back towards the Sun. Mars is moving slowly away from the Sun but is not so bright. The third planet, Mercury, is now moving into a better position, and reaches greatest elongation on Dec 29th, after which it moves back towards the Sun. All three planets are in and around Libra, Scorpius, and Sagittarius so they never get very high in the sky and a clear south eastern horizon is needed to find them.

Meteors: The Geminids are at maximum on Dec 13th and if it is clear you may see up to 100 meteors an hour that night. This shower ends on the 16th. The other major meteor shower this period is the Quadrantids which are active between Jan 1st - 16th. Maximum is Jan 3rd but to see this shower at its best you need to watch after midnight. Obviously, at this time of year if it is clear then it's going to be cold, so wrap up warm.

Comets: If you have a telescope then there are 5 potential comets for you to look for. If you only have binoculars don't despair as this period there is one comet that is hopefully going to put on a good display. The first of the four fainter comets is 78P/Gehrels which fades from 10.5 to 11 mag as it moves through Aries. The second comet, 69P/Taylor rises from 10.5 to 10.3 mag (its brightest this apparition) and is in Cancer. Our third comet is in Leo. 62P/Tsuchinshan is at its brightest at 10.5 mag. The final one is comet C/2003 T4 (LINEAR) which is brightening (from 10.5 to 9.5 mag) as it moves through northern Hercules close to the border with Draco. The best comet though will be comet C/2004 Q2 Machholz. It is already around 5.5 close to Rigel in Orion and will brighten to mag 4 as it passes the Pleiades on Jan 7/8th. This one should be easily visible in binoculars (and even be naked eye from a darker site), is in an easy to find position, and is visible at a very convenient time of night, so you have no excuse to miss this comet (apart from cloud of course). After the second week of January the comet starts to fade, but becomes circumpolar near to Ursa Minor/Draco border and should still be easy to see in a small telescope.

MOON PHASES:

Last Qtr: 5th Dec.; New: 12th Dec.; First Qtr: 18th Dec.; Full: 26th Dec.; Last Qtr: 3rd Dec.

THIS MONTH'S DEEP SKY OBJECTS

"The Orion Nebula"

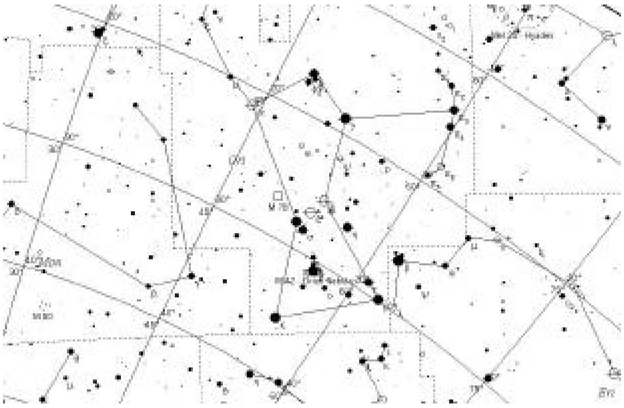
by Paul Warren

This month's deep sky object is M42, better known as the Orion Nebula.

M42 is an emission nebula, in the constellation of Orion. M42 is a magnificent example of an emission nebula, which is caused by the gas absorbing radiation from nearby stars and re-emitting it in the visible spectrum. This nebula is a stellar nebula, where new stars are being born.

M42 is believed to be about 1600 light years away, which would make it about 32 light years across (enough room for 20,000 solar systems stacked end to end!).

Of all the deep sky objects, M42 ranks as one of the easiest to find. Indeed, you can even see it with the naked eye. Locate the belt of Orion, and drop down to his sword. There you will find the nebula glowing.



Through the telescope, M42 is a wonder to behold. As it is bright, so it can take high magnification well. I usually go through my entire eyepiece collection when observing this DSO. The low powered eyepieces allow me to see it in all its glory while the higher powered eyepieces allow me to concentrate on particular bits of it.

The most effective telescope accessory that I have used on M42 is a narrow band nebula filter (Lumicon UHC). With this filter in place, the nebula appears even larger, and there is a lot more structure in the nebula itself to be seen.

As I said earlier, emission nebulae are powered by nearby stars, and M42's powerhouse is right in the centre of it. Embedded within M42 is the multiple star system Theta Orionis, otherwise known as the Trapezium, due to the shape it makes. The trapezium is the most observed quadruple star system in the sky. A small telescope easily resolves Theta, showing the four brilliant white components, although medium to high magnification is necessary.
Larger telescopes can make out another two components, but these seem to be very dependent on the seeing conditions.

North of M42 and visible in the same low power field is M43, which looks like a bloated comma. M43 is actually a piece of the Orion Nebula, but appears to be detached because a dark nebula obscures their connection.

NASA's Space Place

Galactic Surprise

by Patrick L. Barry and Dr. Tony Phillips

Open an old astronomy textbook. The basic sketch you'll find there of galaxy formation is fairly simple: a vast cloud of diffuse hydrogen and helium gas condenses under gravity, and dense spots in the cloud collapse to form stars. Voila! A galaxy.

But real galaxies are much more complex than that. A galaxy is a swirling "soup" of billions of stars and roaming black holes, scattered clouds of gas and dust, random flashes of star birth and exploding supernovas, and an unseen and mysterious substance called "dark matter." Over time, all these ingredients mix and interact—pulling and compressing and colliding—and somehow that interplay leads to the galaxies we see today. No wonder it's such a hard problem to solve!

Just over one year into its three-year mission, GALEX is already shedding some new light on the problem.

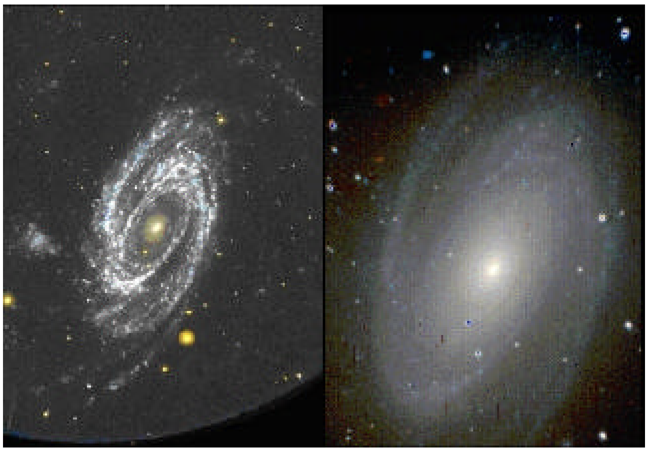
"Some of the discoveries GALEX has made will change our understanding of how galaxies develop and when, where, and why stars form in galaxies," says Peter Friedman, a researcher at Caltech and Project Scientist for GALEX.

This small space telescope, called the Galaxy Evolution Explorer (GALEX for short), makes its discoveries by taking pictures of millions of galaxies scattered over the whole sky. Some of these galaxies are close by (at least by astronomical standards of "close"), while others are as much as 10 billion light-years away. Because light takes time to travel through space, we see these distant galaxies as they appeared billions of years ago. Comparing young galaxies from the distant past with older, modern galaxies will teach scientists about how galaxies change over time.

Looking at these pictures, scientists were surprised to find many newborn stars in the outer parts of old, mature galaxies. Scientists had assumed that as a galaxy ages, the clouds of gas needed to form new stars in these outer reaches either got used up or blown away. Finding so many new stars in these regions of old galaxies (such as Centaurus A, Messier 101, and Messier 81) shows that, apparently, they were wrong.

Friedman says that astronomers don't know yet how to explain these new findings. Rethinking and improving theories to explain unexpected discoveries has always been the way science makes progress—and GALEX is certainly making progress.

One thing is certain: It's time to re-write some old textbooks.



M81 is 10 million light years away. The image on the left was made from GALEX data and shows UV light from hot, new stars. These star forming regions are not detectable in the visible light image on the right. (McGraw-Hill Observatory, Kitt Peak, Arizona, Greg Bothum, Univ. of Oregon.)

For more information, see http://www.galex.caltech.edu/. Kids can do a galaxy art project and learn more about galaxies and GALEX at http://spaceplace.nasa.gov/en/kids/galex/art.shtml.

WHAT'S THIS MAGNITUDE THING?

Part 1 of an article by Guy Yeates

It all started with Hipparchus (190-120 BC) looking up into the night sky over Nicea, in what's now modern day Greece, and feeling a need to systematically catalogue the stars. Back in 2nd century Greece there was no concept of what the stars were other than perhaps as celestial equivalents of the lamps in common every day use. A basic observation of lanterns was that the bigger they are the brighter they are. This appears to be the principle that Hipparchus applied to his stars. This is how the term magnitude, meaning size, became synonymous with the stellar brightness. A key part of his system was to place stars according to their brightness into one of 6 magnitude groups. The brightest stars as seen with the naked eye were assigned to 1st and the dimmest to 6th magnitude. This system was adopted by Ptolemy so that coupled with his influence on astronomical thinking and practice the magnitude lasted mostly unchanged for over 1400 years.

It's 1610 and Galileo is using his telescope to see the moons of Jupiter and rings of Saturn, and generally get himself into a whole heap of trouble with the church. In his travels across the sky he also sees a whole sea of stars that are far fainter those at the limit of his vision. To account for this previously unknown class of star he adapted the magnitude system by introducing magnitude 7. The importance of this generally to astronomical thinking is that telescope allows the eye to see more detail than the eye fainter stars. If his telescope is a little bigger then a bit more detail and a few more stars might be seen…and so on ad infinitum perhaps? The magnitude system ceased to be a limited set of categories and instead became an open ended range of values even allowing for sub-categories to exist i.e. partial magnitudes. Telescope (and imaging) technology today has pushed the magnitude system beyond magnitude 7 to values in excess of 30.

Along came the 19th century and a rapid expansion in technology and scientific thinking coupled with a need to formalise loose astronomical methodology. Directly in the 'line-of-fire' for such change was the stellar magnitude system and in 1856 a Norman Pogson obliged the astronomical community by introducing a mathematical description of the system. He determined that the light intensity of a typical 6th magnitude star was 100 times fainter than that for a typical 1st magnitude star (note the relative term since photon counters are only a recent tool). His mathematics showed him that a difference of 1 magnitude was equivalent to a factor of 2.512 in brightness. Between a typical 1st and 6th magnitude stars was a ratio of their respective light intensity (or flux, energy per unit time per unit area, in modern parlance) of 2.512 to the power of 5 or 1:100. The number 2.512 became known as 'Pogson's ratio'. Differences in magnitude therefore represent a ratio of light intensities (flux). Nineteenth century biology and science in general was very keen on logarithms and the human eye was considered to respond to light in a logarithmic manner such that incremental increases in observed brightness were actually representing huge increases in flux. The magnitude scale was therefore fitted to a logarithmic scale giving it a similar dynamic range to the human eye. However there are a number of issues here. The underlying mathematics describing an eye's response to light was wrong. The eye's response to changes in light intensity mathematically follows a power curve and not a logarithmic curve. This has implications Half way between magnitude 2 and magnitude 4 is mathematically (using a log based scale) is magnitude 3, but estimating a star visually between mag. 2 and 4 will yield a star whose mathematically equivalent magnitude is 2.8. On the whole this issue was not significant when comparing stars of similar brightness., but as their relative brightness increases so do the discrepancies. Pogson assigned magnitude 1 to a typical member of this group. The fainter ones were given partial magnitudes e.g., 1.1, 1.7 etc Now going in the other direction and based on measurements of light intensity the magnitude system heads towards 0 and for some stars, some planets and the Sun we go whizzing past 0 into negative numbers. This explains quite a bit really!

Next month we'll see how the advent of photography altered things all over again.

NOTICES

Observing site: We would like to find a suitable permanent observing site. It needs to havecar parking, be dry, easily accessible, and fairly dark. Obviously, the last requirement is relative as it's difficult to find a truly dark site anymore. We would be willing to pay an annual rent for the use of a site, but we are not rich so the sum would have to be moderate. Does anyone know of an organisation/farm/charity, etc. with some bit of land/car park/similar, that they don't use at night who might be willing to let us go there? Ideally, we would like to stay close to Abingdon but our option may not be that great. Please note, we do NOT want to build an observatory, or anything else for that matter. We just want somewhere to set up the telescopes, as we do on an observing evening at the moment.

Observing Evenings Organiser: I would like to ask for a volunteer to take over the organising of the Observing Evenings. The new organiser would take over from next September as the present programme has already been arranged. Whoever takes over does not have to keep to the present arrangements of 'the first clear night' etc, or just one observing week a month. He/she can do as they like in this regard, and even organise the events at the actual evening if they want to. We are really going to need a volunteer because without one there will be no observing sessions next season at all as I definitely cannot continue in this role. So, if you want to have a chat with me (Bob) about the job, even if you are only considering the position, feel free to phone or email, or see me at one of the meetings.

FURTHER DISCUSSION

The society's e-mailing list is used by members to comment on all things astronomical, as well as other related and not-so-related subjects. The list is also used to publicise "first-clear-night" observing evenings and for alerting members to hot observing news.

To view the messages on the web go to: http://www.smartgroups.com/groups/abastro.

To subscribe to the list either go to this web page and click on "Join the Group" or send an email to abastro-subscribe@smartgroups.com . You will then receive all e-mails sent to the list. To post e-mails on the list: send an email to abastro@smartgroups.com . To unsubscribe: send an email to abastro-unsubscribe@smartgroups.com

Don't forget the Society's web site:
www.abingdonastro.org.uk

Our webmaster, Chris Warwick is always on the look-out for members' photographs to put on there. Don't forget you can read back copies of SpaceWatch on the web site too.

DATES FOR YOUR DIARY

20th Dec: 8pm. Beginners' Meeting in the Perry Room.

3rd – 5th Jan. (FCN*): 8pm Observing Evening at Britwell Salome [FCN = 'first clear night' – ring Bob on 01491 201620 to confirm before setting out.

10th Jan.: 8pm. Speaker Meeting: Prof. Richard Harrison, (RAL), "Oxfordshire's Space Centre".

The editor of "SpaceWatch" is Andrew Ramsey, who would very much appreciate your help and contributions. Please send any news, observations, photos, etc. to:
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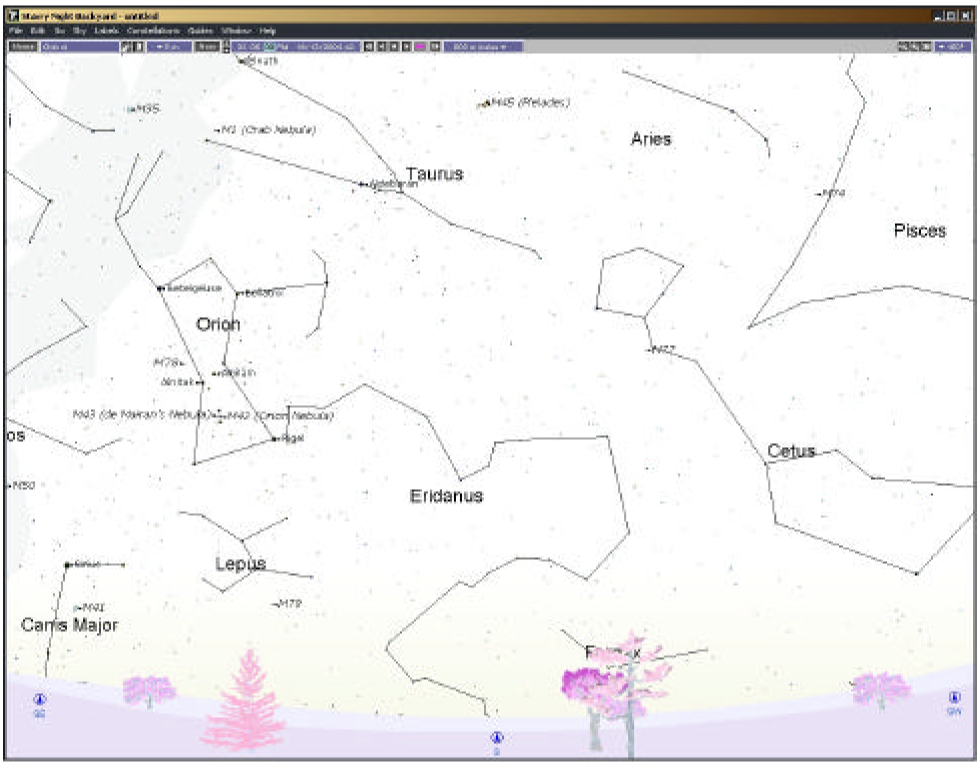
E-mail: AbAstro@ATRamsey.com Phone: 01865 245339

STAR CHART



View looking south at 10pm next Saturday (18th December).

Orion is high in the south at this time of year. Look for M42 – see the Deep Space Object article on pages 1 & 2.

To the bottom left of Orion is Sirius, the brightest star in the whole sky (apart from the Sun of course). For a discussion on star brightnesses, read the article on page 3 on Magnitude.

Merry Christmas to all, and a Happy New Year.