SPACEWATCH

the newsletter of the Abingdon Astronomical Society

January 2003

"Stellar Evolution"

by Pam Spence (Ed. Encyclopædia of Astronomy & Astrophysics)

Happy New Year to you all. I hope you all have an enjoyable and relaxing Christmas and New Year break. Well, the New Year seems to have brought along with it a whole sequence of incredibly clear nights. If you can stand the cold, you'll have been spending many a night outside till the wee hours observing the heavens. I know Paul Warren has, anyway, and apart from his Deep Sky Object this month, he's been describing his other observations on our e-mailing list. Other, perhaps less hardy, members do just as much observing through their CCD cameras on a monitor in the warmth of their houses. Why not take a look at Paul McGale's web site (http://users.ox.ac.uk/~uzdl0265/index.html), where he has many wonderful photographs through with his Meade 8" telescope? If this cold weather continues, we may yet get some good clear observing evenings. The next one is on the first clear night during the period 27th to 29th January at Britwell Salome (that's east of Wallingford just off the B4009 towards Watlington), only a couple of junctions down the M40 from Oxford.

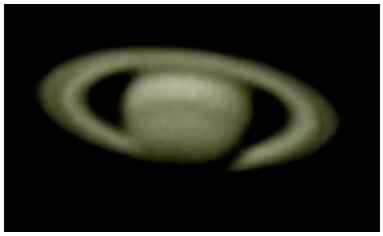
The Night Sky this Month

By Bob Dryden

The Planets:

Jupiter and Saturn:

These two planets are now on display in the evening sky, and what a display it is. Saturn is the higher of the two as it goes dark, sitting in the south-east in the constellation of Taurus at magnitude -0.2. In a telescope it is a magnificent sight as the rings are wide open (at 26.8 degrees) and easily visible in any size instrument. The Moon will be near Saturn on the evening of the 15th.



Saturn photographed by Paul McGale.

Jupiter is lower and to the left of Saturn at sunset. You can't miss it as it is the brightest 'star' in the sky at magnitude -2.5, in the constellation of Cancer. A pair of decent binoculars held steadily will show you the four satellites of Jupiter. From time to time these satellites pass in front of, and behind the planet, causing transits, occultations and eclipses. However, every six years or so, Jupiter and the Earth are aligned such that the satellites can eclipse and occult one another as seen from here. And this is one of those six year periods. These events will continue until about midsummer so you will get plenty of time to witness one of them, although many occur in the early hours of the morning. A listing of forthcoming events will be available at the meeting (ask Bob if you would like one). Look out for Jupiter on the evening of the 19th as it will be close to the almost Full Moon that night.

Venus:

Venus is the other spectacular planet on view at the moment but you will have to look in the morning sky before sunrise. However, since the Sun doesn't rise until around 8am, that's not too arduous. Try wondering out into your garden with your cornflakes and looking in the south-east. The planet is extremely bright (magnitude -4.2) and difficult to miss, in the south east. If you look before the sky gets too bright you will see a much fainter 'star' to the right of Venus, and that is Mars. The gap between the two planets increases as the weeks go by. The Moon will be near Mars on the morning of the 27th, and near Venus on the 28th.

Comets:

There are a number of comets about this period.

Comet C/2002 X5 (Kudo-Fujikawa) has put on a good display during January but it is getting harder to see. Despite a bright magnitude forecast of about 1.5 to 2, it is approaching the Sun now and probably will be hard to find. It will be crossing Aquila in the morning sky if you want to give it a try.

Comet C/2002 V1 (NEAT) is visible in the evening sky, just below the square of Pegasus. It was originally predicted to be about 8th or 9th magnitude (which still would have been good in a telescope) but latest reports seem to indicate it is brighter than it should be, possibly about mag. 6 or 7, so look out for this one.

If you have a telescope then there are two further comets you could try for. Comet C/2001 RX14 (LINEAR) is just below the Plough, and comet P/1992 Q1 Brewington is also just below the square of Pegasus. Both should be around 10th magnitude.

Occultations:

For those of you who don't mind either staying up late, or getting up early, there are two good lunar occultations in January. The first is on January 17th at 02.50 UT when Epsilon Gemini (mag. 3.2) is covered by the Moon. The second is the next morning (18th) at 03.25 UT when magnitude 3.6 Kappa Gemini is occulted.

Moon Phases:

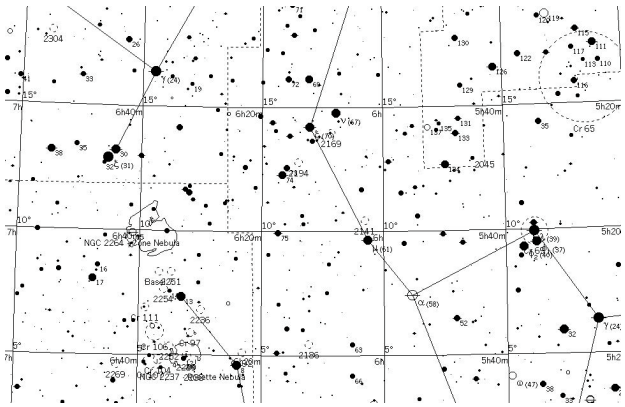
New: 2nd Jan.; First Qrtr: 10th Jan.; Full: 18th Jan.; Last Qrtr: 25th Jan.; New: 1st Feb.; 1st Qrtr: 9th Feb.

This month's Deep Sky Object

By Paul Warren

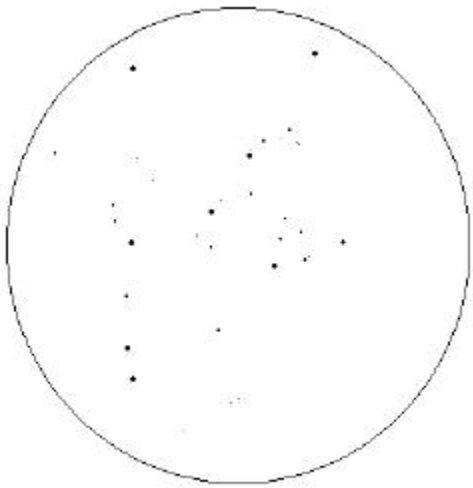
Last month I described how I like to go out "exploring" the night sky, with the assistance of a suitable guide book. I got a new guide book for Christmas, and discovered a very curious open cluster, called NGC 2169.

This little cluster is to be found in the arm or club of Orion. The star marked as ? is better known as Betelgeuse, and I think that just about everybody knows which star this is in Orion.



Now, why do I describe this cluster as being "curious" ? I do so for the simple reason that it proves that 42 is not the answer to Life, the Universe and Everything (I am referring to Douglas Adams excellent work "The Hitch-Hiker's Guide to the Galaxy"). One look at this cluster and a number jumps straight out at you, and it isn't 42 either – it's 37. If you know the Hitch-Hiker's series well, you'll know that Ford Prefect comes from the region of Betelgeuse, and so one can argue that this strengthens the claim the ultimate answer really is 37!

Although I see it as a "37" in my 8 inch scope, I rather suspect that say a 4 inch scope may show it to be "31". The accompanying sketch is a rough guide to what you can expect to see when using an 8 inch scope on a good night.



Now, had I just contented myself with the Messier list I would never have come across this fascinating cluster.

Book Review

By Paul Warren

One of my Christmas present's was the Autumn/Winter volume of The Night Sky Observer's Guide.

This is a fairly substantial book, which is also reflected in its price (£32.00 per volume).

My first impression on seeing it was something along the lines of "Ah, an updated version of Burnham's Celestial Handbook."

However, inspection of the book reveals that this is not the case. Although it provides the same sort of material as Burnham, the emphasis is very much on "Observer's Guide". It is aimed at scopes up to 18" aperture, but is still very useful for smaller apertures. It also doesn't include information on the physical characteristics of DSOs (e.g. size, distance etc).

I've been using it for the past week, and I find it to be much more useful than Burnham when it comes to planning an observing session. There are numerous sketches and photographs, which is useful for confirming that what you saw is what you intended it to be! The finder charts are very good indeed, although I'll still stick with my SkyAtlas charts (largely because I don't want to bring the book outside with me). For each DSO entry, there is a description of what it looks like through various apertures, along with essentials such as coordinates, type of object, magnitude etc.

Each constellation has a chapter to itself, and there is a section on double stars within each chapter.

Each DSO is ranked on a * to ***** basis, and although this can act as a guide for deciding whether to look for it (i.e. * and ** usually require 14+ inches), care must be exercised. For example, B33 (the Horsehead Nebula) is ranked **** (or is it *****?), despite the fact that some people haven't seen it with 30 inches of aperture.

If you're a deep sky nut, then I think this book (and volume 2 (Spring/Summer)) are essentials for your armoury. I'm expecting volume two towards the end of the month (it was out of stock when ordered for me).

Amalthea just a pile of rubble!

Courtesy of Sky & Telescope

The Galileo Orbiter has provided yet more information about one of Jupiter's moons, this time from its flyby of Amalthea on November 5th. It seems that the moon, 270-kilometres wide) is not actually a solid body. Rather it is an agglomeration of rubble held loosely together by gravity.

Galileo scientists made the discovery by first taking the most accurate measurement of Amalthea's mass yet, which was derived from the gravitational pull the moon had on the craft. Next, by dividing that mass result by the moonlet's estimated volume, a team led by John D. Anderson (NASA/Jet Propulsion Laboratory) determined that the Amalthea's density is slightly less than water's at 990 +/- 250 kg m^{-3}, which means it is probably mainly empty space, i.e. boulder-size or larger pieces just touching each other, assuming the moon is made of rock and not ice.

Amalthea's ultra-low density casts into doubt a long-held theory about Jovian moons. Models have suggested that moons closer to the planet are denser than those further out, because Jupiter's initial heat of formation would have baked away any low-density ices that gathered in close-in moons. "Fluffy" volatiles only exist further out.

The theory holds for Jupiter's four largest moons — Io is the innermost and most dense, Callisto is the outermost and the least dense. But Amalthea is clearly less dense than rocky-iron Io despite being closer to Jupiter than the volcanic moon is. A possible solution is that Amalthea was indeed baked but became a rubbly mess because it was completely shattered by impacts. Over time the fragments of the collisions reassembled as the loose pile of rubble we see today.

What remains unclear is just how the empty space in Amalthea is distributed. The term "rubble-pile" could be misleading. There isn't enough information to know if Amalthea is a group of boulders loosely held together, or more like a ball of sand. The question is one of porosity, but is that micro- or macro- porosity?

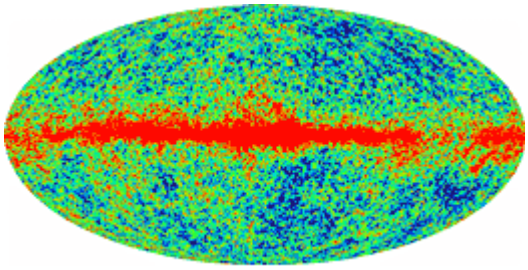
Galileo's 8-year-long mission will end on September 21, 2003, when the craft will plunge into Jupiter.

MAPPING THE MICROWAVE BACKGROUND

Courtesy of NASA

The cosmic microwave background (CMB) radiation is the radiant heat left over from the Big Bang. It was first

observed in 1965 by Arno Penzias and Robert Wilson at the Bell Telephone Laboratories in Murray Hill, New Jersey. The properties of the radiation contain a wealth of information about physical conditions in the early universe and a great deal of effort has gone into measuring those properties since its discovery. This radiation (and by extension, the early universe) is remarkably featureless; it has virtually the same temperature in all directions in the sky.



An image of the cosmic microwave background based on data collected by COBE.

In 1992, NASA's Cosmic Background Explorer (COBE) satellite detected tiny fluctuations, or anisotropy, in the cosmic microwave background. It found, for example, one part of the sky has a temperature of 2.7251 Kelvin (degrees above absolute zero), while another part of the sky has a temperature of 2.7249 Kelvin. These fluctuations are related to fluctuations in the density of matter in the early universe and thus carry information about the initial conditions for the formation of cosmic structures such as galaxies, clusters, and voids. COBE had an angular resolution of 7 degrees across the sky, 14 times larger than the Moon's apparent size. This made COBE sensitive only to broad fluctuations of large extent.

The Microwave Anisotropy Probe (MAP) is making a map of the temperature fluctuations of the CMB radiation with much higher resolution, sensitivity, and accuracy than COBE. The new information contained in these finer fluctuations will shed light on several key questions in cosmology. By answering many of the current open questions, it will likely point astrophysicists towards newer and deeper questions about the nature of our universe.

In the context of Big Bang cosmology there are a number of "free parameters" that are not fixed by the theory but rather by observations of the universe. Since the CMB radiation was emitted so long ago (and far away), it carries a great deal of information about the properties of our universe which can be measured in no other way. Because MAP is able to measure the CMB fluctuations with tremendous accuracy across a wide range of angular scales, it should be able to accurately determine most of the basic parameters of cosmology, which will in turn inform the following questions:

- ? Will the universe expand forever, or will it collapse?
- ? Is the universe dominated by exotic dark matter?
- ? What is the shape of the universe?
- ? How and when did the first galaxies form?
- ? Is the expansion of the universe accelerating rather than decelerating?

[Note that MAP is the first mission to use an L2 orbit as its permanent observing station. L2 is a semi-stable region of gravity that is about 4 times further than the Moon, following the Earth in its orbit around the Sun.]

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 subscribe: send an email to abiastro-subscribe@topica.com . You will then receive all e-mails sent to the list. To post e-mails on the list: send an email to abiastro@topica.com . To unsubscribe: send an email to abiastro-unsubscribe@topica.com

DATES FOR YOUR DIARY

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

27th to 29th Jan. (FCN): 8pm. Observing Evening at Britwell Salome. Phone Bob 0n 01491 201620 to confirm. Ask Bob tonight for a map & directions to the site.

10th Feb.: 8pm. "Our Galaxy" by Prof. James Binney (Oxford University).

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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