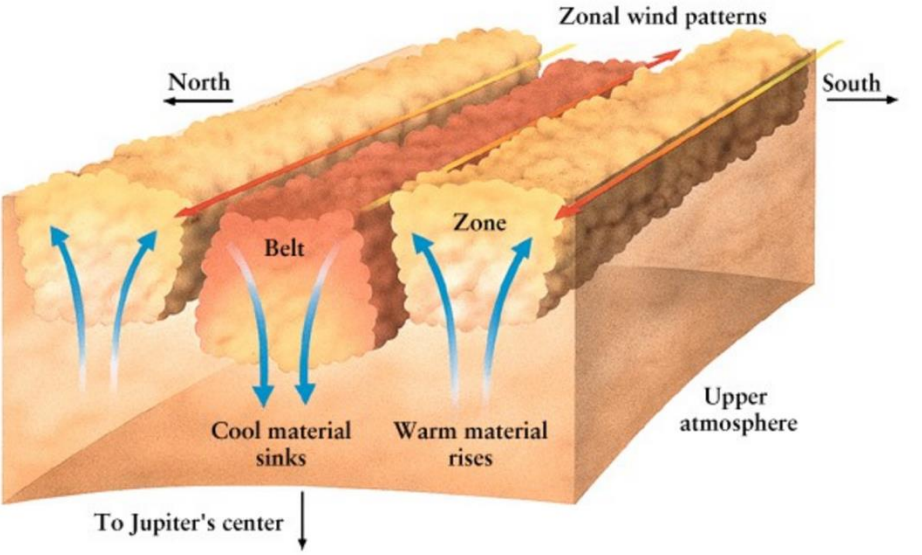
The Messenger
Mexborough & Swinton Astronomical Society March 2016

An Observer's Guide to the Planet Jupiter

By Brian Ventrudo

The planet Jupiter is always one of the brightest objects in the night sky. It's brighter than any star, and is only outshone by the planet Venus and the Moon, and, very rarely, by Mars and Mercury. Jupiter reaches a position for optimum viewing in a telescope once every 13 months, roughly, and as you are about to discover, the visible face of Jupiter reveals so many interesting features in a small telescope that the planet is a favourite target for new and experienced stargazers.

Jupiter is the largest planet and, by far, the largest object in the solar system save for the Sun. The planet is 2.5 times as massive as all other planets combined. Like Saturn, Jupiter is a "gas giant", a massive planet made up almost entirely of cold hydrogen and helium gas along with traces of other gases like ammonia and methane. (Uranus and Neptune are also sometimes called gas giants, or, because they are much colder, "ice giants"). Gas and ice giants do not have well defined rocky surfaces like the Earth. Their outer layers are made entirely of clouds; further down the gas turns to compressed liquid, and at the very centre of these planets may be a rocky carbon core.



(Continued on centre pages)

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The Thoughts of Chairman Les

I would like to welcome those of you that have become members since my last thoughts. You have joined the best society in the UK and I hope that you have many happy years with us.



Our Aquarius Project is moving along albeit slowly. YWS are very poor at getting back with their answers. We have made one or two offers for the purchase of the land at our site with little reply. We have put together the Access Document for RMBC Planning Dept. from which we have a reply that there are a couple more details of what our requirements are.

We are keeping busy with our PVE's and we are visiting RSPB 19 March. We continue with our Outreach Programme to reach such places as schools, scouts, cubs etc. which is proving to be very popular and much in demand. We have yet a very good program of events for the month with Gary Poyner as our guest speaker. Other speakers are Paul D'Silva, Phil Muffett, Roy Gunson and Tony Morris. What a month to look forward to.

The Astrophotography Group is continuing very enthusiastically with a lot of being done at the observatory on a weekly basis. Anyone with interest in this are welcome to visit at the observatory on Tuesday nights.

Our Imaging Competition took place 29 January and was very well supported with nine entrants. As usual Tony M did a fantastic job of preparing and presenting the evening.

Our Aquarius Project continues in earnest with the meetings taking place on a regular basis. Drawings and sketches continue to be prepared with all ideas and suggestions being dealt with as they present themselves. Yorkshire Water Services continues to very slow with their replies.

We have much work planned for this year so we must keep our nose to the grind stone.

Les Marsden



Mick Nichols and Steve Bowden after last month's talk on "Astrophotography"

Andrew Kirton-Vaughan's March Skynopsis



Diary for March

1st	Moon at Last Quarter.
8th	Jupiter at opposition
9th	New Moon. Total Solar eclipse in Indonesia
15th	Moon at First Quarter
20th	Spring Equinox
22nd	Conjunction between Moon and Jupiter
23rd	Full Moon.
31st	Moon at Last Quarter

Planetary Notes for March

Mercury will soon pass in front of the Sun at inferior solar conjunction so from Rotherham, it is not observable
Venus is getting very close to the sun and from Rotherham not really observable being no higher than 2° above the horizon at dawn.
Mars is visible as a morning object and from Rotherham; it is visible in the morning sky. It will become visible after about 1:00am, when it rises above the south-eastern horizon. It will then reach its highest point in the sky around 5 in the morning but only 18° above the horizon.
Jupiter is approaching opposition, and from Rotherham, it is visible in the morning sky. It will become visible as a bright object above Eastern horizon after 7:30pm. It will then reach opposition on the 8th of March, and is at its largest visible size being some 44 seconds of arc in diameter.
Saturn is visible in the dawn sky. It will rise around 2am for most of the month, and get up to about15° above the southern horizon before fading from view as dawn breaks.

There is a total solar eclipse on Wed, 09 Mar 2016 at 01:58 GMT which means it's on the other side of the planet and it will be best seen from Indonesia. From United Kingdom no eclipse will be visible. There will also be a penumbral lunar eclipse on 23rd March, however at about noon our time so we will have to miss it due to being only visible from the Pacific Ocean and Australia.

Jupiter and the Moon will pass close to each other, within 1° 57' of each other at 2:48am on Tuesday 22nd March

Dwarf Planet 136472 **Makemake** is at opposition on Tuesday, 22 Mar 2016 at 01:43 GMT. Makemake will be in the constellation Coma Berenice and visible for much of the night. Its co-ordinates will be RA 12h 55m 20s, Dec +25° 44'. It will be at magnitude 16.9 – so we should be able to capture it in the C14 at Hoober. Makemake will be 51.6 AU from Earth.

Comet C/2013 US10 (CATALINA) continues to fade and will be at magnitude 10 on March 1st (RA 4h 8m 44s, Dec 58° 2'), by the 31st it will be down to magnitude 11.8 (RA 4h 23m 24s, Dec 49° 48')
Comet C/2014 W2 Panstarrs at perihelion on 10th. Visible at Mag12. (RA20h 33m, Dec 65° 23')

There are a great selection of galaxies in Ursae Major to look at this month, M51, M81, M82, M101, M106, M108, and M109. Don't forget to peek at the Great Cluster in Hercules, M92.

This months double star challenge is Epsilon Bootis (Izar) – Golden yellow primary and blue secondary, you will need at least a 4 inch aperture as the separation of the two stars is just under 3 arc seconds.

Back to Basics

A quick trip to dictionary corner this month.

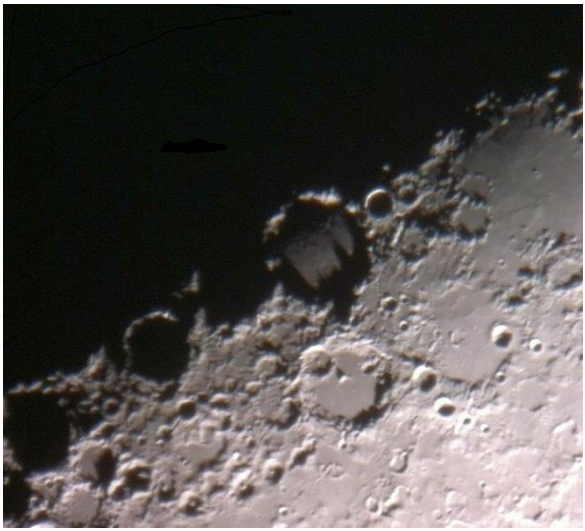
Astronomers use many technical terms and it can be difficult to keep up with them . Over the next few months we'll try to list a few of them with a simple explanation. This month we look at orbital terms. Looking up at an object we can refer to positions ZENITH. This is the point in the sky which is directly above the location. So the zenith of a location will change as the sky rotates, unless you are standing under the North or South Celestial Pole. The opposite of the zenith is the NADIR which is the point on the celestial sphere directly beneath a given position or observer and diametrically opposite the zenith.
If we were describing the orbit of an object about the Earth the PERIGEE is the distance when it is closest to the Earth and APOGEE when it is farthest from the Earth.
However if we are describing orbits about the Sun then the closest distance is known as PERIHELION and the farthest distance is APHELION. A way to remember the difference is that the terms for the sun have the root 'helio' in them – from the Greek for Sun.

Brain teaser :
What might happen if you say "Filigree, Apogee, Pedigree, Perigee" to Les?

Paul D'Silva

Dawn on Ptolemais

At 7.5 days old Ptolemaus lies on the terminator which allows a perfect viewing window of the central regions of the moon in the early evening. Ptolemaus lies just south of Sinus Midii and is on the edge of the central southern uplands forming part of a chain of craters which include Herschel to the north, Alphonsus, Arzachel and Alpatragus to the south.



This area of the moon consists of light continental craters which are rich in calcium and aluminium, the darker areas containing more titanium, iron and silicon. Ptolemaeus is one of the most famous "walled plains" some 90miles in diameter, the plain has a dark hue and a craterlet called Ammonius, the crater wall is fairly continues rising 9,000ft above the plain. If your timing is fortunate daybreak can be observed on Ptolemaeus as beams of light appear on the plaines floor and grow over an hour or so. The curvature of the floor can be seen as half of the plain is in shadow once the sun has cleared the mountainous crater wall. This event can be more pleasurable with friends of a similar disposition thanking Les Marsden, Glen Marsden and Dave Armeson for an entertaining evening of observations.

Philip Muffett

MSAS Astrophotography Competition



This was held on January 29th at the club with almost a record 7 entrants. It was won by Max Frier – it was his first go at entering. Mick Nichols slipped to second after his success in 2015, Andy Kirton-Vaughan came third.
The photograph to the left shows Max receiving his Amazon voucher prize from Tony Morris, and one of his "winning" photographs of the Horsehead and Flame Nebulae, Orion Nebula and M42 Globular Cluster are shown below.







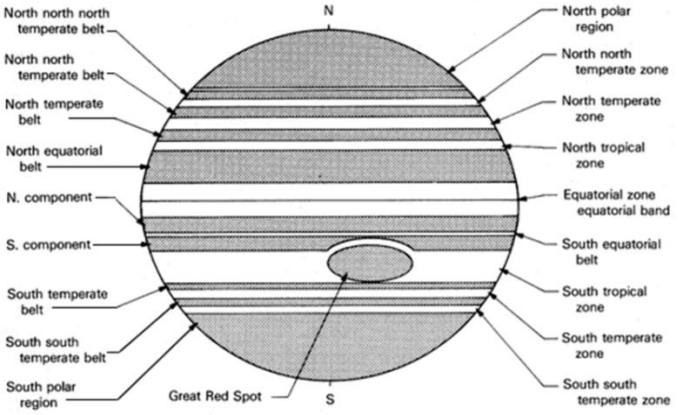
An Observer's Guide to the Planet Jupiter (continued)

What To See On the Face of Jupiter

As backyard observational astronomers, we are most interested in the part of Jupiter we can see: the outer layers of the atmosphere. To see any detail on the face of Jupiter, a telescope is required. But even with the smallest telescope, you can see structure in the atmosphere, usually two dark bands surrounded by lighter regions. The dark bands on the face of Jupiter are called belts and the lighter bands between them are called zones. The two prominent belts you see in the image at top are the north equatorial belt (NEB) and the south equatorial belt (SEB) since they each lie just north and south of the equator, respectively. These are the most prominent belts, and they are visible in nearly any small telescope, but there are many more visible in steady sky with larger telescopes at higher magnification.

The belts and zones are caused by churning layers of gas in the atmosphere. The rotating atmosphere has segmented itself into layers that are confined to certain latitudes on Jupiter, much like the trade winds on Earth blow in the same place and same direction throughout the year. The zones are caused by convection regions wherein warm gas rises, cools, and sinks repeatedly in the upper atmosphere. The belts are regions of cooler gas that have sunk lower in the atmosphere. The belts are dark and colourful, with tones of red, salmon, tan and brown. The colour comes from phosphorus compounds that are ionized by radiation and lightning in the fast-moving winds. The zones, which are regions of warmer rising gas, are usually pale-yellow or white caused by ammonia gas crystallizing and blocking the view of the more colourful gases below.

The interplay between the planet's rotation, high winds, and convective rise and fall of gases have resulted in a complex structure of belts and zones, the structure of which is more or less permanent, at least over decades and perhaps centuries. The structure of the observable atmosphere of Jupiter along with the names of the major belts and zones are shown below.



Not all the belts and zones in the images above are easily distinguished, but the most prominent regions visible in small telescopes are the equatorial belts and zones, the temperate belts and zones, and the darker polar regions.

Jet streams of opposite direction on each edge of the belts and zones confine each structure, and as the gases whirl across the face of the planet at speeds exceeding 300 km/h, turbulence occurs at the boundaries. This turbulence leads to intricate and exceedingly beautiful structures called garlands and festoons between and within each belt and zone (again, see image at the top of this page). On nights of steady seeing, you can get glimpses of these structures in a small telescope.

As on Earth, the dynamic atmosphere of Jupiter and the so-called Coriolis force lead to circulating cells of gas that result in cyclonic storms. On Earth, these churning cells are about as high as these are tall, but

Jupiter's faster rotation flattens its cells and stretches the cells longitudinally into flattened ovals. Some of these oval cells coalesce into visible and long-lasting vortices, the most famous of which is the Great Red Spot (GRS). This spot straddles the south equatorial belt and the lighter south tropical zone, impinging on each. The GRS, which is larger than Earth, has been observed for centuries and may be a permanent feature in the Jovian atmosphere. This is not to say it never changes. The GRS and the SEB both change colour at unpredictable intervals. When the SEB turns lighter, the GRS darkens and vice versa. During the past several decades, the GRS was darkest in the periods 1961–66, 1968–75, 1989–90, and 1992–93. No one knows why it changes, or indeed what causes its red colour.

Best Times to See Jupiter

At its closest approach to Earth, the planet's disc spans about 50" (arc seconds) which makes it easy to observe.

Some telescopes are better than others for seeing Jupiter and the other planets. But the best telescope for you is the one you have right now. Here's how to get the most out of your optics and your situation when looking at Jupiter…

First, you need to pick the right time to see Jupiter, namely, when Earth is closest to the planet. That time is when Jupiter is at opposition, when it is opposite the Sun in the sky. At opposition, the planet rises in the east as the Sun sets in the west. But Jupiter is large enough to look good for a few months on either side of opposition, so there's still plenty to see. The next oppositions of Jupiter fall on March 8, 2016, April 7, 2017, and May 9, 2018.

Next, you need a night with good steady seeing. You'll learn more about this later in the course. But you can tell if the air is steady and the "seeing" is good if stars exhibit very little twinkling. If the air is turbulent, even a big telescope will show Jupiter as a boiling featureless blob.

Tips for Observing Jupiter in a Telescope

What's the best telescope to see Jupiter? We haven't discussed telescopes yet, but here are a few tips. Generally, you want a long focal length which gives you a larger image for a given eyepiece. Refracting telescopes are often best because they have an unobstructed view and so provide the best image contrast. Larger aperture gives more resolution of fine detail, assuming your sky conditions allow it. And if you use a Newtonian reflector telescope, make sure it is well collimated.

With whatever telescope you presently have at your disposal, use as much magnification as it will handle when you look at the planet. This depends on the quality of your optics and on the seeing. Generally a magnification of 30-50x the aperture of your telescope (in inches) works well on nights of average seeing. So if you have a 4-inch telescope, try 120x to 200x. If you have razor sharp optics and steady sky, you can get away with even more magnification. But you should experiment. Start at low magnification and work your way up until you get the best combination of image size and contrast and clarity. The best magnification may change from night to night because of changing sky conditions.

Another tip—make sure you give your telescope time to come to equilibrium with the outside temperature. If you bring a telescope from a warm house to a much cooler outdoor environment, for example, it will take 15-30 minutes for the scope to cool down. During this time, the lenses or mirrors will be somewhat warped from their ideal shape, and there may be moving air currents inside the tube. These effects will cause image distortion until things settle down. A big telescope generally takes longer to come to equilibrium.

With all planets in amateur telescopes, the images, even at high magnification, will be quite small. You may find this disappointing at first. But even small images can present nearly as much detail and colour as you see in magazine-grade images of Jupiter (see image below). Wait for moments of steady air and you will see tiny details snap into view, including the smaller belts and zones, festoons, the GRS (if visible) and possibly other smaller spots and shadows cast by the moons. Patience is critical: you might need to watch Jupiter through your telescope for half an hour to get just a few flashes of detail when the air steadies. But these fleeting moments make the effort worthwhile.

In time, as you build your astronomical toolkit, you will acquire colour filters which fasten onto the back of your eyepieces. These filters help bring out more detail on the planets. A quick suggestion: try a green filter or a da*rk blue filter with Jupiter to bring out the contrast of the red belts and spots.*

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Programme for March & April 2016

Date	Time	Location	Subject / Event	
Thu Mar 3rd	18:45	Club Room	"Historical Novae"	*Gary Poyner*
Tue Mar 15th	18:45	Observatory	CAE – St Thomas School, Kilnhurst	*Jez Robinson*
Wed Mar 9th	18:45	Observatory	CAE – High Green Scouts	*Jez Robinson*
Wed Mar 9th	19:45	Club Room	Executive Committee Meeting	
Thu Mar 10th	19:45	Club Room	"Back to Basics"	*Paul D'Silva*
Tue Mar 15th	18:45	Observatory	CAE – St Thomas School, Kilnhurst	*Jez Robinson*
Wed Mar 16th	11:00	Observatory	CAE – High Green Scouts	*Jez Robinson*
Thu Mar 17th	19:45	Club Room	TBA	*Phil Muffett*
Fri Mar 19th	19:45	Observatory	PVE	*Les Marsden*
Sat Mar 19th	17:00	Old Moor	PO - "Betelgeuse & Barn Owls"	*Les & Phil*
Thu Mar 24th	19:45	Club Room	"Astronomy Quiz"	*Roy Gunson*
Thu Mar 31st	19:45	Club Room	"It's about Time"	*Tony Morris*
Thu Apr 7th	19:45	Club Room	"Gravity, Friend or Foe"	*Jez Robinson*
Wed Apr 13th	19:45	Club Room	Executive Committee Meeting	
Thu Apr 14th	19:45	Club Room	Astronomy News	*Various*
Fri Apr 15th	19:45	Observatory	PVE	*Les Marsden*
Sat April 16th	19:45	Observatory	PVE	*Les Marsden*
Thu April 21st	19:45	Club Room	"Gravitational Lensing"	*James Nightingale*
Thu April 28th	19:45	Club Room	"Earth"	*Roy Gunson*

Old Moor RSPB – Manvers Way, Barnsley, S73 0YF
Clifton Park –Clifton Lane, Rotherham, S65 2AA
Thryberg Country Park – Doncaster Rd, Rotherham, S65 4NU
PVE – Public Viewing Event – Bookable Only
CAE – Community Access Event
PO – Public Outreach
TBA – To be announced – (otherwise – We don't know!)

Web site: http://msas.org.uk
Meeting room is at Swinton Working Men's Club, Station Street, Swinton, South Yorkshire, S64 8AU.
Observatory is at Lee Brook Lane, Hoober, S62 7SH
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