

# “ $\Omega > 1$ ”

## “Sky-Notes” of the Open University Astronomy Club.

**March 2017.**

### Forthcoming Meetings.

#### OUAC.

The next “Clubnight” is on Tuesday 7<sup>th</sup> March.

#### BAA.

Full details of BAA meetings at: [www.britastro.org](http://www.britastro.org)

#### SPA.

Saturday 1<sup>st</sup> April.

“Spring Convention”.

Institute of Astronomy. Cambridge.

Full details at: [www.popastro.com/meetings/convention](http://www.popastro.com/meetings/convention)

### Highlights of the Month.

7 <sup>th</sup>	Mercury at Superior Conjunction.
20 <sup>th</sup>	Spring (N Hemisphere) Equinox.
22 <sup>nd</sup> /23 <sup>rd</sup> .	Comet 41P/Tuttle-Giacobini-Kresak imaging opportunity. See notes below.
25 <sup>th</sup>	Venus at Inferior Conjunction.
26 <sup>th</sup>	British Summer Time begins at 01:00 UT.
Venus.	Brilliant object dominating the W evening twilight.
Mars.	A moderately bright object in the SW early evening sky.
Jupiter.	Available for long hours of observation and imaging.
Saturn	An “early hour” object low in SE.

### Recent Events.

If you have any images and/or reports of recent events please contact Sheridan so that he can put them on the Club website.

If you wish to present them at a “Clubnight” meeting please contact Sheridan or myself before the meeting starts.

### Software.

A very useful item of Planetarium software is “Stellarium” and it’s FREE! Go to the website and download it and the associated user manual.

# 1. The Solar system.

**Note all times shown are UT.**

## Earth.

**Spring (N Hemisphere) Equinox March 20<sup>d</sup> 10<sup>h</sup> 30<sup>m</sup>.**

**British Summer Time begins March 26<sup>d</sup> 01<sup>h</sup> 00<sup>m</sup>. Clocks go **FORWARD** one hour.**

### Aurora.

Hours of darkness give the opportunity for observing potential aurora.

Keep tuned to the [www.spaceweather.com](http://www.spaceweather.com) site for updates.

Subscribe (free) to the UK AuroraWatch website to receive alerts.

### ISS.

Commencing a series of morning apparitions for the first three weeks of March. Go to the “spaceweather” website and click the “Flybys” button and follow the instructions to set-up forecasts for your location. Alternatively go to the “Heavens Above” website and set-up for your location. Add to your “favourites”.

### Iridium Flares.

These satellites produce short lived “Bright events”. Some are very bright in the order of magnitude -8. Take a wide-field image of with an exposure of 20 – 30 seconds to capture an event. Regular observing of events brighter than -4 will provide useful practice for estimating the magnitude of very bright meteors and Fireballs. Go to the “Heavens Above” website and set-up for your location for predictions.

## Sunrise and Sunset.

### Bedford.

**Latitude 52° 6.9’N Longitude 0° 28.1’W**

Date.	Rise.	Transit.	Set.
01	06 <sup>h</sup> 48 <sup>m</sup>	12 <sup>h</sup> 15 <sup>m</sup>	17 <sup>h</sup> 42 <sup>m</sup>
08	06 <sup>h</sup> 32 <sup>m</sup>	12 <sup>h</sup> 13 <sup>m</sup>	17 <sup>h</sup> 54 <sup>m</sup>
15	06 <sup>h</sup> 16 <sup>m</sup>	12 <sup>h</sup> 11 <sup>m</sup>	18 <sup>h</sup> 07 <sup>m</sup>
22	06 <sup>h</sup> 00 <sup>m</sup>	12 <sup>h</sup> 09 <sup>m</sup>	18 <sup>h</sup> 19 <sup>m</sup>
29	05 <sup>h</sup> 43 <sup>m</sup>	12 <sup>h</sup> 07 <sup>m</sup>	18 <sup>h</sup> 31 <sup>m</sup>

## The Sun.

To prevent permanent damage to your eyes avoid looking at the Sun directly and never with binoculars or a telescope unless special (expensive!) filters are used. The safest way is the simplest – project the image of the Sun onto grey or white card.

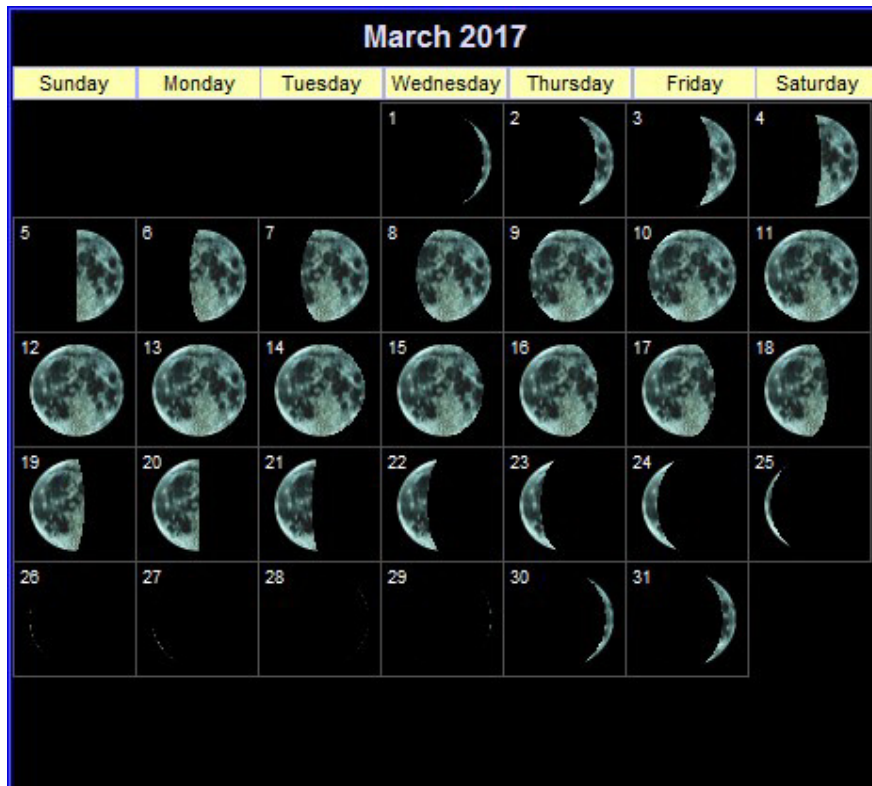
Currently (late February) a few low activity sunspot groups. If you have or have access to observe in h-alpha the rewards are much greater.

Keep in touch with the Solar Dynamics Observatory satellite at <http://sdo.gsfc.nasa.gov/>  
Add the “Spaceweather” and the “Soho Lasco C3” websites to your “favourite” websites.

## The Moon.

### Phases:

First Quarter	05 <sup>d</sup> 11 <sup>h</sup> 32 <sup>m</sup>
Full	12 <sup>d</sup> 14 <sup>h</sup> 54 <sup>m</sup>
Last Quarter	20 <sup>d</sup> 15 <sup>h</sup> 20 <sup>m</sup>
New	28 02 <sup>h</sup> 57 <sup>m</sup>



Produced using LunarPhase Pro.

## The Moon cont.

### Apsides:

Perigee	03 <sup>d</sup> 07 <sup>h</sup>	Diameter. 32' 23"	Distance. 369,061km.
Apogee	18 <sup>d</sup> 17 <sup>h</sup>	Diameter. 30' 02"	Distance. 404,652km.
Perigee	30 <sup>d</sup> 12 <sup>h</sup>	Diameter. 32' 50"	Distance. 363,856km.

### Observing.

#### For northern observers:

- The waxing crescent Moon is very well placed.
- The waxing gibbous Moon is well placed.
- The Full Moon is well placed.
- The waning gibbous Moon is becoming less well placed.
- The waning crescent Moon is less well placed.

Observe the regions along the terminator (sunrise and sunset on the Moon) where the low angle of the Sun highlights lunar topography. A basic lunar map is all you need to get started. *Sky & Telescopes* "Lunar 100 Card" is another good starting point. If you are starting out on photography and/or imaging the Moon provides an excellent target.

#### Opportunities.

On 26<sup>th</sup> and 27<sup>th</sup> (Very challenging!) try locating the very thin crescent Moon very low in the ESE dawn skies **before sunrise**.

On 29<sup>th</sup> (Very challenging!) and 30<sup>th</sup> try locating the very thin crescent Moon evening twilight **after sunset**.

If you can take images of the above so much the better.

#### Lunar Occultations.

Unlike the gradual disappearance of a planet (small disc) a star vanishes instantly demonstrating that it is a point source of light as viewed from the earth. For all occultation events start observing 10 to 15 minutes before the predicted time to identify the required star and to allow for slightly different time if you are not at Greenwich. Use an accurate watch to record the time that *you* observe the occultation remembering that times are UT not BST. Disappearance is behind the dark limb (DD) of the Moon unless otherwise stated. Enter details in your observing log.

On the 4<sup>th</sup>/5<sup>th</sup> the Moon passes in front of the Hyades star cluster in Taurus. Starts about 20:00 on the 4<sup>th</sup> and is still in progress when the Moon sets about 01:00 on the 5<sup>th</sup>.

Details of occultations can be found in current *BAA Handbook* and monthly periodicals such as *Astronomy Now* and *Sky at Night*.

## The Planets.

### Mercury.

Superior Conjunction on 7<sup>th</sup>.

Watch for reappearance low in W evening twilight in second half of the month when it commences a favourable evening apparition for N hemisphere observers.

Conjunction with Uranus on 26<sup>th</sup>.

Moon close on 29<sup>th</sup>.

Date.	Mag.	Dia.	Phase.	Rise.	Transit.	Set.
20	-1.2	5.7''	0.84	06 <sup>h</sup> 25 <sup>m</sup>	12 <sup>h</sup> 57 <sup>m</sup>	19 <sup>h</sup> 30 <sup>m</sup>
31	-0.1	7.4''	0.44	05 <sup>h</sup> 57 <sup>m</sup>	13 <sup>h</sup> 13 <sup>m</sup>	20 <sup>h</sup> 31 <sup>m</sup>

### Venus.

Brilliant object dominating the W evening sky. Make the most of the opportunities to observe and image the rapidly waning crescent with associated increase in diameter.

Inferior Conjunction on 25<sup>th</sup>.

Watch for reappearance low in E dawn Sky at the end of the month. Early risers in the following weeks should make the most of the opportunities to observe and image the rapidly waxing crescent with associated decrease in diameter.

Moon close on 1<sup>st</sup>.

Date.	Mag.	Dia.	Phase.	Rise.	Transit.	Set.
01	-4.6	47''	0.16	07 <sup>h</sup> 00 <sup>m</sup>	14 <sup>h</sup> 01 <sup>m</sup>	21 <sup>h</sup> 03 <sup>m</sup>
15	-4.3	57''	0.05	05 <sup>h</sup> 49 <sup>m</sup>	12 <sup>h</sup> 54 <sup>m</sup>	19 <sup>h</sup> 59 <sup>m</sup>
22	-4.1	59''	0.01	05 <sup>h</sup> 15 <sup>m</sup>	12 <sup>h</sup> 12 <sup>m</sup>	19 <sup>h</sup> 09 <sup>m</sup>
31	-4.1	58''	0.02	04 <sup>h</sup> 37 <sup>m</sup>	11 <sup>h</sup> 18 <sup>m</sup>	17 <sup>h</sup> 59 <sup>m</sup>

### Mars.

A moderately bright object in the W evening twilight.

Small disc making surface details more difficult to observe and image.

Moon close on 1<sup>st</sup>, 2<sup>nd</sup> & 30<sup>th</sup>.

Date.	Mag.	Dia.	Phase.	Rise.	Transit.	Set.
01	+1.3	4.6''	0.94	08 <sup>h</sup> 00 <sup>m</sup>	14 <sup>h</sup> 52 <sup>m</sup>	21 <sup>h</sup> 45 <sup>m</sup>
31	+1.5	4.2''	0.96	06 <sup>h</sup> 42 <sup>m</sup>	14 <sup>h</sup> 17 <sup>m</sup>	21 <sup>h</sup> 52 <sup>m</sup>

The Mars **Curiosity** and **Opportunity** rovers continue to return excellent data and images.

Mission details and progress are on the appropriate NASA websites.

## Jupiter.

Well placed for nightlong observation and imaging as it heads towards Opposition on 7<sup>th</sup> April.

Fine aspect N of Spica in Virgo.

Excellent target for imaging.

For details of satellite phenomena see *BAA Handbook* and monthly periodicals.

Moon close on 14<sup>th</sup>/15<sup>th</sup>.

Date.	Mag.	Dia.	Rise.	Transit.	Set.
01	-2.3	42''	21 <sup>h</sup> 21 <sup>m</sup>	02 <sup>h</sup> 50 <sup>m</sup>	08 <sup>h</sup> 15 <sup>m</sup>
31	-2.6	44''	19 <sup>h</sup> 05 <sup>m</sup>	00 <sup>h</sup> 41 <sup>m</sup>	06 <sup>h</sup> 13 <sup>m</sup>

## Saturn.

Located in Sagittarius.

An "early hour" to predawn object for observation and imaging.

Fine aspect with the Rings wide open although low declination does not favour northern observers.

Moon close 20<sup>th</sup>.

Date.	Mag.	Dia.	Rise.	Transit.	Set.
01	+0.5	16''	03 <sup>h</sup> 12 <sup>m</sup>	07 <sup>h</sup> 11 <sup>m</sup>	11 <sup>h</sup> 09 <sup>m</sup>
31	+0.4	17''	01 <sup>h</sup> 19 <sup>m</sup>	05 <sup>h</sup> 17 <sup>m</sup>	09 <sup>h</sup> 15 <sup>m</sup>

Don't forget to visit the Cassini mission websites at <http://saturn.jpl.nasa.gov> and <http://ciclops.org>

## Uranus.

Becoming lost in SW evening twilight towards the end of the month.

Conjunction with Mercury on 26<sup>th</sup>.

Moon close 1<sup>st</sup> & 29<sup>th</sup>.

Date.	Mag.	Dia.	Rise.	Transit.	Set.
01	+5.9	3.4''	08 <sup>h</sup> 01 <sup>m</sup>	14 <sup>h</sup> 46 <sup>m</sup>	21 <sup>h</sup> 31 <sup>m</sup>
31	+5.9	3.4''	06 <sup>h</sup> 06 <sup>m</sup>	12 <sup>h</sup> 54 <sup>m</sup>	19 <sup>h</sup> 42 <sup>m</sup>

## Neptune.

Conjunction with the Sun on 2<sup>nd</sup>.

Too close to the Sun to be observed.

Moon close (1°) on 26<sup>th</sup> but very difficult to spot in bright dawn twilight. **Take care if sweeping with binoculars as sunrise is imminent!**

Date.	Mag.	Dia.	Rise.	Transit.	Set.
31	+8.0	2.2''	04:55	10:15	15:34

## Dwarf Planets.

- Ceres.** Becoming lost in W evening twilight at the end of the month. Moon close on 30<sup>th</sup>.  
**Eris..** Too close to the Sun to be observed.  
**Haumea.** A CCD target located in Bootes.  
**MakeMake.** A CCD target in Coma Berenices. At Opposition on 23<sup>rd</sup>.  
**Pluto.** Low into the SSE predawn skies.

## Asteroids. (Approx mag +10.5 or brighter).

- Vesta (4).** Located in Gemini S of Pollux. Mag +6.4 fading to +6.8 during the month.  
**Psyche (16).** Located in Leo. Mag +10.3 at opposition on 3<sup>rd</sup>.  
**Daphne (41).** Located in Leo. Mag +9.6 at opposition on 8<sup>th</sup>.  
**Diotima (423).** Located in Virgo. Mag +10.7 at opposition on 27<sup>th</sup>.

Charts and details of asteroids one month either side of opposition are available at:

[http://britastro.org/computing/charts\\_asteroid.html](http://britastro.org/computing/charts_asteroid.html)

See also the *BAA Handbook* and/or monthly periodicals.

## Comets.

### Comet 2P/Encke.

At about mag +5 it may just be spotted in western darkening twilight at the start of month as it heads towards perihelion on 10<sup>th</sup>.

**Comet 2015 V2 (Johnson).** An early hour to predawn object predicted to be about mag +9 as it moves slowly through northern Hercules close to tau ( $\tau$ ) and not far from the globular cluster NGC6229 (+9.4).

**Comet 41P/Tuttle-Giacobini-Kresak.** Heading towards perihelion on 12<sup>th</sup> April it moves rapidly through Leo, Leo Minor and into the bowl of the Plough. Between 22<sup>nd</sup> and 23<sup>rd</sup> it passes east of Merak (beta ( $\beta$ ) UMa) and between the galaxy M108 (+10.0) and the planetary nebula M97 (The Owl Nebula) (+9.9). It may be a 7<sup>th</sup> magnitude object at this time. The Moon rises about 02:00 so excellent imaging opportunities if clear!

Charts and details of selected comets are available at:

[http://britastro.org/computing/charts\\_comet.html](http://britastro.org/computing/charts_comet.html)

See also the *BAA Handbook* and/or monthly periodicals.

## Meteor Showers.

No major showers this month.

There are always **sporadic** events and the chance of a brilliant fireball. The latter should be recorded and reported.

## Near Earth Objects.

Please refer to [www.spaceweather.com](http://www.spaceweather.com) for updates.

## Eclipses.

No Solar or Lunar Eclipses this month.

## 2. The Deep Sky.

Abbreviations used.

**M** = Messier object (Shown in **bold**).

NGC = New General Catalogue. IC = Index Catalogue (Extension of the NGC).

ds = double star. ts = triple star. ms = multiple star. vs = variable star.

gc = globular cluster. oc = open cluster. pn = planetary nebula.

en = emission nebula. rn = reflection nebula. sg = spiral galaxy.

eg = elliptical galaxy. lg = lenticular galaxy. ir = irregular galaxy.

pg = peculiar galaxy. snr = super nova remnant. ly = light year.

The magnitude of an object, excluding double, triple, multiple and variable stars, is shown in brackets e.g. (6.5).

All magnitudes are + unless otherwise shown.

### 2.1 Variable Stars of the month.

**Beta ( $\beta$ ) Persei, Algol.** Range 2.2 to 3.4, period 2.7 days. Sinking into the NW by late evening. Favourable minima at “social hours” occur on 20<sup>d</sup> 22.2<sup>h</sup> and 23<sup>d</sup> 19.06<sup>h</sup>.

**Delta ( $\delta$ ) Cephei.** Range 3.5 to 4.4, period 5.37 days. The prototype for the Cepheid class of variable stars. Their period-luminosity relationship has led them to being used as “standard candles” in measuring distances to nearby galaxies.

**Mu ( $\mu$ ) Cephei.** Range 3.7 to 5.0, approximate period 755 days. A semi-regular variable star famous for its striking red colour being fittingly called “Herschel’s Garnet Star”. It is the reddest naked eye star visible from the northern hemisphere. Its colour may show signs of variability.

**Omicron ( $\omicron$ ) Ceti Mira.** The classic long period variable star. Beginning to fade from maximum (+3.4) in February.

**U Ori.** Well placed for early evening observation. Brightening towards max (+6.3) in Apl.

### 2.2 Double Stars of the month.

**Zeta Cnc.** See notes below.

**Iota Cnc.** See notes below.

**h (Herschel) 3945 CMa.** See notes below.

**Alpha Gem (Castor).** See notes below.

**Alpha Leo.** See notes below.

**Gamma Leo.** See notes below.

**54 Leo.** See notes below.

**12 Lyn.** See notes below.

**38 Lyn.** See notes below.

**Beta Mon.** See notes below.

**k Mon.** (Not to be confused with  $\kappa$ ). See notes below.

**k Pup.** (Not to be confused with  $\kappa$ ). See notes below.

**Zeta UMa Mizar.** See notes below.

**Xi UMa.** See notes below.



## 2.3 This Month's Constellations - Double Stars/Star Clusters/Nebulae/Galaxies.

### Cancer (Cnc).

Zeta ( $\zeta$ ) ts. 5.6/6.0/6.2; separation AB 0.8", ABxC 5.7". Beautiful triple system of yellow stars. AB requires a large aperture to split.

Phi-2. ( $\psi^2$ ) ds. 6.3/6.3; separation 5.1". A beautifully matched pair of white stars.

Iota-1. ( $\iota^1$ ) ds. 4.2/6.6; separation 30.5". Striking gold and blue pair visible in small telescopes.

Struve ( $\Sigma$ )1245 ds. 6.0/7.2; separation 10.3". A multiple star. Yellow-white primary with yellow secondary. White third component.

NGC2632 (**M44**) (3.1) oc. Praesepe (The Beehive). Easily visible to the naked eye although any slight haze will soon hide it therefore making it a good test for sky conditions. In binoculars and lower power on telescopes it is a beautiful object and well suited to the novice astrophotographer. Large telescopes reveal a field of faint galaxies lying beyond the cluster.

NGC2682 (**M67**) (6.9) oc. Often overlooked because of its more famous neighbour this cluster containing some 200 members is well worth locating. It is one of the oldest open clusters known.

NGC2775 (10.3) sg. Located on the Cancer/Hydra border a few degrees NNE of Hydra's head.

**Active galaxy OJ+287.** A BL Lac object subject to regular outbursts. Requires regular monitoring with reports being submitted to the BAA Variable Star Section.

### Canis Major (CMa).

Alpha ( $\alpha$ ) Sirius (-1.5). The brightest star in the sky the Sun and supernova and nova excepted. Sirius has a fascinating magnitude 8.5 companion discovered in 1862 by Alvan G. Clark when testing a new 18.5 inch refractor, nicknamed "The Pup", and subsequently identified as an object now called a white dwarf. These stars are the final stages of Sun-like stars that have exhausted their supply of nuclear fuel and have collapsed to form a dense object which will gradually cool and fade from view to become a cosmic cinder. More massive stars follow a different path by "exploding" in an event called a supernova that leave behind even more dense compact objects - neutron stars or black holes. Because of its close separation and glare from Sirius the "Pup" provides a challenge for keen amateurs under favourable conditions.

Pi ( $\pi$ ) ds. (4.7/9.7. sep. 11.6"). Yellow-white primary with bluish secondary.

Mu ( $\mu$ ) ds. (5.3/8.6 sep. 3.0"). Striking contrast of deep yellow primary with blue secondary.

Tau ( $\tau$ ) ds. (4.4/10.5 sep. 8.2"). Pale yellow primary with pale blue secondary. Part of a multiple system set in a rich field of stars.

17 ts. (5.8/9.3, sep. 44.4"). White primary with two orangish companions. Part of a multiple system.

Herschel (h) 3945 ds. (4.8/6.8, sep. 26.6"). Superb Orange and blue pair in the same league as Albireo in Cygnus and Almach in Andromeda.!

NGC2287 (**M41**) +4.5 oc. A fine open cluster located about 5° south of Sirius. It would be easily visible to the naked eye if it reached greater altitude in our skies.

NGC 2345 (7.7) oc. Large loose irregular cluster.

NGC 2354 (6.5) oc. Loose irregular cluster set in a rich star field.

NGC 2362 (4.1) oc. Rich compact cluster surrounding Tau..

NGC 2383 (8.4) oc.

NGC 2207(10.7) sg. Elongated with bright core. Interacting with IC2163 visible as a faint smudge on E edge of 2207.

NGC 2217(10.4) sg. Fairly round with slightly brighter centre situated in a rich star field.

## Canis Minor (CMi).

Alpha ( $\alpha$ ) Procyon (0.4) has a fascinating companion (12.9) which is white dwarf star. Spotting the companion presents amateurs with a difficult challenge under favourable conditions.

Struve ( $\Sigma$ ) 1103 ds. (7.7/9.2, sep. 4.4"). Pale yellow primary with pale blue companion.

Struve ( $\Sigma$ ) 1149 ds. (7.9/9.6, sep. 21.7"). Fine pair of pale yellow and pale blue stars.

NGC2470 sg. (12.7). Elongated with bright core.

Canis Major.

## Hydra (Hya).

This constellation straggles its way across the southern winter/spring skies. The moderately bright stars forming the monsters head are located east of Procyon.  $\alpha$  Hya is located some 15° SE of the head.

Epsilon ( $\epsilon$ ) qs. 3.8/4.7/6.8/12.4. Located in the "head" about five degrees south of M67 in Cancer.

NGC2548 (**M48**) (5.8) oc. A fine open cluster containing some 80 stars. To locate form an equilateral triangle (apex south) with M48 as the apex, Procyon and the hydra's head as the other corners.

NGC3242 (8.6) pn. Nicknamed "The Ghost of Jupiter" as it appears similar in size to the planet. Bright bluish object with irregular edges. The 12<sup>th</sup> magnitude central star is prominent in 8" and larger telescopes.

NGC4590 (**M68**) (8.2) gc. Located about 4° south of  $\beta$  Crv. Not well seen from UK latitudes.

## Leo (Leo).

This easily recognized constellation is also a fine hunting ground for many moderately bright galaxies providing an excellent area to practice "star-hopping" skills as there are many bright reference stars should you go astray.

Leo contains some fine double stars.

Alpha ( $\alpha$ ) = **Regulus** ds. 1.4/7.7; separation 176.9". Regulus is blue/white, the companion is yellowish.

Gamma ( $\gamma$ ) ds. 2.2/ 3.5; separation 4.4". Deep yellow primary with pale yellow companion.

54 ds. 4.5/6.3; separation 6.5". Pale yellow primary with blue-green companion.

88 ds. (6.4/8.4) separation 15.4". Yellow primary with yellow companion.

90 Leonis ds. 6.0/7.3; separation 3.3". Both stars are bluish-white. A third deeper blue member of the system (8.7) separation 63" in p.a. 234°.

A "route" of exploration I enjoy is to start with the "bright" galaxy NGC2903 at the western end of the "Sickle" and follow the curve of the sickle until Regulus is reached, then move to the "underbelly" containing M95/M96 and then to the tail where M65/M66 are located. Finally drop down the hind leg to the bright but rather isolated NGC 3521. Following the above route will lead you to encounter numerous moderately bright galaxies some of which make pleasing groups in the same low power/wide field of moderate aperture telescopes. Don't be afraid to use high magnification once you have located an object.

NGC2903 (8.9) sg. A spiral galaxy inclined to our line of sight. One of the brightest galaxies in Leo surprisingly it is not a Messier object.

NGC3190 (11.0) sg and NGC3193 (10.9) eg. Pair of galaxies located mid-way between  $\zeta$  and  $\gamma$ .

NGC3226 (11.4) and NGC3227 (10.8) about 1° east of  $\gamma$  form a close interacting pair of galaxies.

NGC3351 (**M95**) (9.7) sg, NGC 3368 (**M96**) (9.2) sg and NGC 3379 (**M105**) (9.3) eg. An excellent trio in the same low power field located about 3° south of 52 Leo. Close to M105 is NGC 3384 (10.0) eg.

## **Leo continued.**

NGC3623 (**M65**) (9.3) sg, NGC3627 (**M66**) (9.0) sg and NGC3628 (9.5) sg. Located about 3° SSE of  $\theta$  form another fine trio in a low power field. NGC3628 is seen edge-on and begins to reveal a dark dust lane at higher power with moderate apertures.

NGC3596 (11.0) sg. Located about a degree east of the M65/M66 group.

NGC3607 (10.0) eg. and NGC3608 (11.0) eg. A close pair of galaxies midway between  $\theta$  and  $\delta$ .

NGC3626 (10.9) sg. Located about one degree east of NGC3607.

NGC3655 (11.9) sg. Located about two degrees southeast of NGC3607.

NGC3686 (11.4) sg. Located about one degree NNE of NGC3655.

NGC3521 (8.9) sg. "Star-hop" southwards from the M65/M66 group to locate this bright spiral galaxy which is often overlooked as it lies some way south of the main body of Leo. Another object overlooked by Messier?

Two objects belonging to the "Local Group" of galaxies are located in Leo. Both are dwarf galaxies and are extremely difficult to view visually but make excellent targets for CCD imagers.

Leo I is located a mere third of a degree north of Regulus whose light drowns the feeble glow of the small stellar system.

Leo II is located two degrees north of  $\delta$ . It is smaller and fainter than Leo I.

Exploring the triangle of bright stars forming the "back-end" of Leo with a moderate aperture telescope will provide some pleasant surprises for galaxy hunters and useful experience in correct identification. I leave this to you!

## **Leo Minor (LMi).**

A small indistinct constellation above the northern borders of "Leo" containing a number of moderately bright galaxies worth locating and providing a good opportunity for you to practice "star hopping" in a small area of sky.

NGC3003 (11.7) and NGC3021 (12.1) form a close pair. Take care when identifying the identity of this pair as NGC3021 has a higher surface brightness.

NGC3184 (9.7) although just over the border in neighbouring Ursa Major this spiral galaxy is easily located about 1° west of  $\mu$ UMA.

NGC3245 (10.8) Elliptical galaxy.

NGC3254 (11.5) Spiral galaxy seen almost edge-on.

NGC3294 (11.7) Spiral galaxy.

NGC3344 (9.9) Spiral galaxy. It is the largest and brightest galaxy in Leo Minor. A ninth magnitude double star lies 1' to the east which interferes with the view.

NGC3395 (12.1) and NGC3396(12.2) Interacting Spiral and Peculiar galaxies.

NGC3414 (10.7) Spiral galaxy.

NGC3430 (11.5) Spiral galaxy.

NGC(3432 (11.2) Spiral galaxy seen nearly edge-on.

NGC3486 (10.3) Spiral galaxy seen nearly edge-on.

NGC3504 (11.1) Spiral galaxy.

## **Lynx (Lyn).**

5. ds. 5.3/9.8; sep 31.4". Fine yellow and blue pair.

12. ts. 5.4/6.0/7.1; sep 1.7", 9". Fine trio of white stars.

19. ds. 5.6/6.5; sep 14.8". Fine pale yellow and pale blue pair forming part of a quadruple system.

The C (10.9) component lies 74" to the WNW of B. The D component (8.9) lies 215" N of AB.

38. ds. 3.9/6.6; sep 2.7". Fine contrasting white and "rust" coloured pair.

NGC2419 (10.5) gc. Located about 7° north of Castor ( $\alpha$  Gemini) this globular cluster at first appears rather uninspiring. At a distance of 300,000 light years it is one of the most distant objects of its class. Because of its great distance, almost twice that of the Large Magellanic Cloud, it was dubbed the "Intergalactic Tramp" by the eminent astronomer Harlow Shapley.

NGC2683 (9.7) sg. A fine nearly edge-on spiral galaxy located on the borders of Lynx and Cancer about 5° west of  $\alpha$  Lyn.

## **Monoceros (Mon).**

This faint and rather indistinct constellation is located between Orion and Canis Minor.

Beta ( $\beta$ ) ts. 4.7/5.2/6.1 Sep. AB = 7.3', sep BC = 2.8". Striking triple of bluish white stars.

Epsilon ( $\epsilon$ ) ts. 4.5/6.5 sep. 13.4". Close pair of pale yellow stars. The third mag 12.7 bluish white member is visible in 12"+ apertures.

NGC2244 oc (4.8). Fine open star cluster surrounded by NGC2237-9 "The Rosette Nebula" which is best seen using a UHC filter. Shows well in photographs.

NGC2261 en (10v). "Hubble's Variable Nebula". Located about 2° southwest of NGC2264 this a fascinating object and well worth monitoring for changes in shape and brightness due to the enveloped variable star R Monocerotis. The triangular wedge appears is almost comet like. Detailed star chart available for telescope owners.

NGC2264 oc + en (4.0) The "Christmas Tree Cluster". A fine open cluster with associated nebula that includes the "Cone Nebula".

NGC2323 (**M50**) oc (5.9). Superb open cluster.

There are many other open clusters in this area of the Milky Way - NGC's 2215(8.4), 2286(7.5), 2301(6.0), 2335(7.2), 2343(6.7), 2353(7.1) and 2506(7.6).

## **Puppis (Pup).**

The Milky Way passes through this faint constellation presenting fine star fields and many open star clusters including three Messier objects for your collection.

Sigma ( $\sigma$ ) ds. (3.3/9.4, sep. 22.3"). Fine unequal pair of orange and yellow stars.

Herschel (h) 4038 ds. (5.5/8.5, sep. 27.0"). Pale yellow primary with reddish secondary.

Herschel (h) 4046 ds. (6.0/8.4, sep. 22.1"). Gold primary with white secondary set a rich star field.

k ds. (4.5/4.7, sep. 9.9"). Fine pair of blue-white stars. (Not to be confused with  $\kappa$ ).

NGC2437 (**M46**) (6.1) oc. Contains the planetary nebula NGC2438(10.5). It is a foreground object and not a genuine member of the cluster.

NGC2422 (**M47**) (4.4) oc. Large and bright. A fine object not best seen from the UK..

NGC2447(**M93**) (6.2) oc. Another fine object not well seen from the UK.

Setting limits of magnitude 10.5 and declination -25° try locating the following open clusters: NGC's 2421(8.3), 2423(6.7), 2432(10.2), 2455(10.2), 2479(9.6), 2482(7.3), 2509(9.3), 2539(6.5) and Mel 71(7.1).

## Sextans (Sex).

A small constellation containing a couple of fine double stars and some interesting galaxies.

35 ds. 6.3/7.4; separation 6.8". Yellow primary with yellow-orange companion.

Σ1441 ds. 6.4/9.9; separation 2.6". Orange primary with fainter yellow companion.

NGC3115 (9.1) is an elliptical galaxy called "The Spindle Galaxy" for its obvious shape which is easily visible in moderate apertures.

NGC3166/3169 (10.6/10.4). A close pair of interacting spiral galaxies visible in the same field of view.

## Ursa Major (Uma).

Zeta (ζ) Uma ds. +2.3/+4.0, separation 14.4". Better known as Mizar, the penultimate bright star in the tail. Closer naked eye inspection shows that Mizar (2.5) has a fainter companion named Alcor (4.0). The pair provide a good test for reasonable eyesight. The pair form an optical double ie. they are not physically associated. Through large binoculars or small telescopes Mizar itself is shown to have a fourth magnitude companion, separation 14", forming a true binary system.

Xi (ξ) ds. 4.3/4.8; separation 1.8". Close pair of golden stars.

NGC3031 (**M81**) (6.9) sg. One of the more beautiful spiral galaxies seen almost face on.

NGC3034 (**M82**) (8.4) ig or sg? An intriguing object that even in moderate apertures appears "strange". It may be an irregular or small spiral galaxy. Once thought to be an exploding galaxy, current theory favours a "starburst galaxy" ie a galaxy undergoing an intense period of star formation.

M81 and M82 are bright enough to be seen in binoculars and close enough to be viewed in the same low power field of a telescope. They are probably physically associated in space. A photograph with both in the same field of view makes for an interesting comparison.

NGC 3077 (9.8) eg. Visible on the edge of the same field as M81 and M82 at low power.

About 2° SE of β UMa a low power field will reveal two very different deep-sky objects:

NGC3556 (**M108**) (10.7) sg. Seen almost edge-on.

NGC3587 (**M97**) (12.0) pn. The "Owl Nebula". Two dark patches in the ghostly disc give the distinct impression of two large eyes requiring moderate apertures to see. It is one of the faintest of the Messier objects.

NGC3992 (**M109**) (10.6) sg. About a degree SE of γ UMa this object is best observed using high power to remove the bright star (a natural form of light pollution!) out of the field of view.

NGC5457 (**M101**) (7.7) sg. About 6° east and slightly north of Mizar. Although large because it is face-on it has a low surface brightness making observation slightly more difficult than one might at first expect.

**M40** A pair of ninth magnitude stars just over a degree NE of δ UMa.

P.V.H.