Don Signori's NexStar50 Club Encyclopedia

Some of the objects on the Nexstar 50 list are Messier objects and were discussed in previous lessons. As we go forward with a set of discussions on our Nexstar 50 list, we will revisit some of these objects. Doesn't hurt and perhaps there are one or two out there who need a bit of a refresher.

Personal observation. The Messier objects and the objects in our Solar System provide us with some of the very best views. But both are done all the time by everyone. It was great to see that several objects in our Nexstar 50 included objects other than those in the Messier catalogue and our Solar System. For this the folks who voted need to be commended. For there is much more than Messier in our skies.

And now on with the show.

(Prepared by Don Signori – Nov., 2001)

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1) Orion Nebula (M42 / NGC1976) A 'Diffuse' nebula in the constellation Orion. If not the prettiest Nebula in the night sky it is almost certainly the easiest Nebula to observe with any size optical instrument. It can also be spotted with the naked eye as a small fuzzy patch below Orions Belt.

The Orion Nebula is about 1500 light years distant, located in the same spiral arm of our Galaxy as the Sun. The Trapezium cluster of stars is located at the center of this Nebula and will be touched on at a later date.

M 43 or De Mairan's Nebula is often included as part of M 42 in most images and is seen separated from the main nebula by an impressive, turbulent dark lane.

http://seds.lpl.arizona.edu/messier/m/m042.html

http://seds.lpl.arizona.edu/messier/m/m043.html

2) Hercules Cluster (M13 / NGC6205) The 'Great Globular Cluster' in the constellation Hercules. I was never big on star clusters. But trough the observations of some of the folks here I have a better appreciation for these magnificent objects. They may not be as grand as a galaxy but they certainly are a grand sight through any sized telescope.

There are several hundred thousand stars in the Hercules Cluster and some believe more than a million. The age of this object has had its share of guesses. Ranging from 14-24 billion years. But in this case age does not matter. Even at a mag. nearing 6 it is an ok naked eye object under dark moonless skies.

M 13 was discovered by Edmond Halley in 1714.

http://www.seds.org/messier/m/m013.html

http://www.seds.org/messier/Mdes/dm013.html

3) Ring Nebula (M57 / NGC6720) A Planetary Nebula in the constellation Lyra. This is a pretty easy object to find with most scopes. The challenge here is to try to spot its central white dwarf star.

Now we can't see the brilliant color through our scopes as we see in images of the Ring. But imagine when you are looking at this object how it would look flying through this long colorful tunnel of gas. Well ok. Maybe up close it is so dispersed that we would not see much. It is heading towards us at about 24km/sec. And is only 2,000 ly away or less.

A good read on this object and its central star:

http://www.seds.org/messier/m/m057.html

4) Saturn An object in our very own neighborhood in the constellation.....pick one. :-).

Although Galileo was the first to observe it with a telescope in 1610, Saturn has been known since prehistoric times. Up to 1977 Saturn was believed to be the only planet with a ring system. It was later discovered that all of the gas planets had ring systems, albeit faint, of their own.

Saturn is about 9.5 AU from the Sun or over 900,000,000 million miles. Since 1979 it has been visited by the Pioneer and Voyager space craft and will have a visit by the Cassini space craft in 2004.

I may be off on this but I believe Saturn's density is so low that if one had an ocean large enough it would float on top. An interesting sight to be sure.

Two prominent rings (A and B) and one faint ring © can be seen from the Earth. The gap between the A and B rings is known as the Cassini division. The much fainter gap in the outer part of the A ring is known as the Encke Division (but this is somewhat of a misnomer since it was very likely never seen by Encke). The Voyager pictures show four additional faint rings. Saturn's rings, unlike the rings of the other planets, are very bright (albedo 0.2 - 0.6).

Though they look continuous from the Earth, the rings are actually composed of innumerable small particles each in an independent orbit. They range in size from a centimetre or so to several meters. A few kilometre-sized objects are also likely.

Saturn's rings are extraordinarily thin: though they're 250,000 km or more in diameter they're less than one kilometre thick. Despite their impressive appearance, there's really very little material in the rings—if the rings were compressed into a single body it would be no more than 100 km across. The ring particles seem to be composed primarily of water ice, but they may also include rocky particles with icy coatings.

Saturn has at least 18 named moons (satellites) with over a dozen more candidates with provisional names. We may be finding new moons for this and the other gas planets for a long time.

Saturn is worth the look at any time the skies are clear. Easy with the naked eye as a steady star point, or with binoculars over 15 power for a possible oval shaped object (a circle with ears?) or any sized telescope. Saturn is a treat always.

http://www.seds.org/nineplanets/nineplanets/saturn.html

Now this may not mean much to some of you but the escape velocity for Saturn is 35,600 meters per second. Compare that to the escape velocity of Earth, 11,200 meters per second and we can see it would take one heck of a booster rocket to get off the ground (gas) of Saturn.

Saturn rotates pretty fast for its size going around once every 10.2 Earth hours. But takes its time going around the Sun once every 29.5 Earth years.

Saturn's average mean temp. is 88K or -301F.

http://pds.jpl.nasa.gov/planets/welcome/saturn.htm

http://nssdc.gsfc.nasa.gov/photo_gallery/photogallery-saturn.html

Type Saturn in any search engine (Google) and you will have hundreds/thousands of information & image sites.

5) Earths Moon You likely all know that our Moon orbits 384,400 km from Earth, is about 3476 km in diameter, was first visited in 1959 by the Soviet Luna II Spacecraft, has had a total of 12 humans step foot on its surface between July 20, 1969 & December 1972, has a crust that averages about 68km thick but varies from near 0 under Mare Crisium to 107 km North of the crater Korolev on the lunar far side. So I'm not going to bore you with all the stuff you already

know. Nor am I going to tell you how the Moon was formed. Its formation or existence is still being debated and some of the thoughts are even nuttier than I am.

We will delve more into our closest neighbour once we begin our Nexstar Lunar 50. I would be failing my readers if I did not point out a couple of minor points. A.) The Moon is zooming away from us at a little more than 2 centimetres per year. Do we need to be concerned about that now? You do the math. :-). B.) There is no such thing as the Dark side of the Moon (except for a small pole area the entire Moon gets about equal sunlight) and the Moon does rotate/spin or what ever term one wishes to use. It just happens to spin at the same rate as it revolves around us so we always see the same side. I think due to some wobble we see a little more than 50% of the Moon but I could not locate a reference for it so don't quote me.

6) Andromeda Galaxy (M31 / NGC224) New calculations put M31 at 2.9 million ly. and is situated in the Constellation Andromeda. Whatever its real distance it is still the furthest object visible to the unaided eye. Personally, and perhaps due to older eyes, I can only spot it with averted vision if it is really dark. This is an easy object for any optical instrument from the smallest binoculars to the largest of telescopes. Through an 8" or larger scope and with a good imagination its grandeur and size can be hypnotic.

M31's mag is an easy 3.4 and is part of our local group of galaxies which includes M31's 2 companions M110 & M32, our own Milky Way, M33 among others. Guesstimates are still being refined as to the total mass of M31 but it should come in at well over 500 billion stars.

http://www.seds.org/messier/m/m031.html

The center of Andromeda appears to have a double 'nucleus' but scientists are not sure why. But one thought is that one nucleus may be the remains of smaller galaxy "eaten" by M31. A Massive Black Hole may also be at work here.

http://antwrp.gsfc.nasa.gov/apod/ap971101.html

http://antwrp.gsfc.nasa.gov/apod/ap961011.html

Books can be written on most any object & Andromeda is no different. It is well worth the read for when you have the time to look into it further.

7) Dumbell Nebula (M27 / NGC6853) A planetary nebula in the constellation Vulpecula. It is thought by some that the Ring Nebula may resemble the Dumbell if seen from a different view. If this is so then one can imagine the Dumbell appearing to be a tunnel shaped object if seen from one of the poles. This is speculation on my part and of no scientific value. Just a neat thought that we have so many of these tunnel shaped clouds we could fly through. But let us keep to the facts. :-).

Charles Messier on July 12, 1764 discovered M27. It was the first Planetary Nebula ever discovered. This is one of only 4 planetary nebula in the Messier catalogue.

As noted in our Messier discussions, nebula are the toughest objects to try to get an accurate distance for. Current guesstimates vary from a low of 490 ly to a high of about 3500 ly. I have no idea but tend to believe it to be under 1,000 ly. None of these distances should matter much to us as long as we are able to enjoy the view with our amateur equipment. And at about 7.4 magnitude it should be easy for most of our scopes.

http://www.seds.org/messier/m/m027.html

8) Pleiades / Seven Sisters (M45) A very bright easy to spot mag 1.6 object in the constellation Taurus. I'm thinking the authors of this list should have included the mom & pop stars to make it a little more challenging. ("father" Atlas and "mother" Pleione). Although claims of being able to see up to 14 of the member stars of M45 with the naked eye have surfaced, most would be fortunate to see 6. I can see 4. 5 if I lie a lot. :-). But some folks do have extraordinary eyesight so who knows. There are about 500 stars in this cluster, mostly pretty faint.

Along with the names of the mom & pop stars are of course the names of the Seven Sisters themselves. Now I know you all know them by heart but I will add them here to help me get to know them. They are:

Alcyone, Asterope (a double star), Electra, Maia, Merope, Taygeta and Celaeno. (I'm thinking it might be time to start naming stars with today's more common easier to pronounce names like Alice, Betty, Susan and the like).

http://www.seds.org/messier/m/m045.html

A little map created by Bill Arnett including the names:

http://www.seds.org/billa/twn/img/m45map.gif

For those who may not have the time to click on the links I give you a bit of 'Lore' about the Seven Sisters.

The Western Mono Indians saw in the Pleiades 6 wives who ate onions and were thrown off their huts by angry husbands. They wandered off to the sky and became the Pleiades. Later the husbands felt lonely and sorry and looked for their wives, but they were never found again.

http://www.seds.org/messier/more/m045_lore.html

According to the ancient Greeks, the Pleiades were seven sisters.

In Greek, the word "Pleiades" means "doves." Their parents were Pleione and Atlas who was condemned by Zeus to support the Heavens on his shoulders. One day, the Pleiades were traveling with their mother and met the hunter Orion.

Orion fell in love with Pleione and her charming daughters. He spent a great deal of time chasing after them, trying to win their affection. After several years, Zeus intervened and transformed the women into doves to help them escape. They flew into the sky to become the cluster of stars that today has their name. However, only six stars are visible in the sky without a telescope. The ancient Greeks explained the absence of a seventh star with several different stories. According to one story, one of the Pleiades, Merope deserted her sisters because she was ashamed of having a mortal husband, who also happened to be a criminal.

http://windows.arc.nasa.gov/cgi-bin/tour_def/mythology/pleiades.html

9) Jupiter The king of our Solar System of planets. It is believed that with a little more mass, Jupiter could have become a small star. What a different place our Earth would be with 2 Suns. Jupiter orbits 778,330,000 km (5.20 AU) from the Sun. Its mass is about 318 times that of the Earth and contains twice the mass of the other 8 planets combined.

Jupiter shines brightly at about mag. -2 +/- and along with its four largest moons Io, Europa, Ganymede and Callisto is a very easy target for binoculars and any sized telescope.

Viewing Jupiter from one night to the next will always provide the observer with a different image as the gaseous clouds swirl around this mighty planet. When on the Earth side, Jupiter's famous Great Red Spot is hard to miss. It was first discovered some 300 years ago and is a storm system so large that two Earths would fit nicely into it. Although called The Great 'Red' Spot, this active system actually appears in various shades of oranges beiges and others. As mentioned, this system was first discovered some 300 years ago. But it is likely a safe bet that this storm has been going on for many hundreds of years longer. Perhaps thousands of years. And may continue for hundreds more. Not enough is known about this or similar storm systems on Saturn & Neptune. (Note: The thousands of years is IMHO only.)

Jupiter has at least 16 known named moons. As is the case with Saturn and the other gas planets, more moons/satellites are likely waiting to be discovered.

http://www.seds.org/nineplanets/nineplanets/jupiter.html

Like Saturn, Jupiter has its own ring system. These rings are too dark for Earth observation. The rings were first imaged by Voyager I in 1979. The same year, most of the important observations of Jupiter's rings were provided by Voyager 2 after it went into the shadow of the giant planet and looked back toward the sun and saw a system of three rings. In just one image the spacecraft captured a faint outer ring, apparently made up of fine, microscopic particles. This was named the gossamer ring.

http://www.jpl.nasa.gov/galileo/rings/fact.html

http://www.jpl.nasa.gov/galileo/

10) Wild Duck Cluster (M11 / NGC6705) An open cluster in the constellation Scutum, the Wild Duck is an easy binocular and telescope object. It is situated in the Northern area of the 'Scutum Star Cloud', a rich star field called 'The Gem of the Milky Way' by E. Barnard. On a personal note, I don't see how they came up with the Wild Duck name, but that is a Don thing. It was Admiral Smyth who noted that the main group of brighter stars resemble "a flight of wild ducks."

This cluster contains about 2900 stars and it is said that if we were at its center our skies would be filled with several hundred first magnitude stars.

While I often warn of impending doom about objects speeding towards us, I am pleased to report that M11 poses no such threat. It is receding at about 22 km/sec. Whew. Missed a bullet this time.

http://www.seds.org/messier/m/m011.html

http://antwrp.gsfc.nasa.gov/apod/ap001022.html

11) Bode's Galaxy (M81 / NGC3031) and Cigar Galaxy (M82 / NGC3034) Ahhh. Two for the price of one. Bode's Galaxy, a nice 'Spiral' & the Cigar Galaxy, the only 'Irregular' Galaxy in Messier's catalogue, can both be found in the constellation Ursa Major. Both are estimated to be about 12 million ly's distant (or more) and come in at about 6.9 & 8.4 mag. respectively.

It is believed that a few tens of million years ago, which is semi-recently on the cosmic time scale, a close encounter occurred between the galaxies M81 and M82. During this event, larger and more massive M81 has dramatically deformed M82 by gravitational interaction. The galaxies are still close together, their centers separated by a linear distance of only about 150,000 light years.

Both of these galaxies were discovered together by Johan Elert Bode in 1774.

These two mammoth galaxies have been locked in gravitational combat for the past billion years. The gravity from each galaxy dramatically affects the other during each hundred million-year pass. Last go-round, M82's gravity likely raised circulating density waves rippling around M81 resulting in the richness of M81's spiral arms. M81, though, left M82 a messy pulp of exploded stars and colliding gas so violent it emits bright X-rays. In both galaxies, colliding gas has created a recent abundance of bright new stars. In a few billion years only one galaxy will remain.

http://www.seds.org/messier/m/m081.html

http://www.seds.org/messier/m/m082.html

http://antwrp.gsfc.nasa.gov/apod/ap000209.html

http://www.seds.org/messier/more/m081-082_more.html

http://www.noao.edu/kpno/mosaic/m81_m82.html

12) Swan Nebula (M17 / NGC6618) A really pretty Diffuse Nebula in the constellation Sagittarius. This nebula is known by many names. I personally like Omega but it is also known as the Horseshoe, or Lobster Nebula. I believe I read where it is also known as the Checkmark but can't find any reference at the time of this writing. The mass of the gas has been estimated to amount to about 800 times that of the Sun, enough for forming a conspicuous cluster, and a good deal more than that of the Orion nebula M42. At mag. 7 it is easy for binoculars and small telescopes.

http://www.seds.org/messier/m/m017.html

The Swan Nebula is brighter than its neighbour the Eagle Nebula. The Swan is an 'Emission' Nebula (as is M42) meaning: "Emission nebulae are clouds of high temperature gas. The atoms in the cloud are energized by ultraviolet light from a nearby star and emit radiation as they fall back into lower energy states (in much the same way as a neon light). These nebulae are usually red because the predominant emission line of hydrogen happens to be red (other colors are produced by other atoms, but hydrogen is by far the most abundant). Emission nebulae are usually the sites of recent and ongoing star formation."

http://www.seds.org/billa/twn/types.html#emission

http://antwrp.gsfc.nasa.gov/apod/ap000919.html

As with many of the names given to objects, I can't see a Swan no matter which way I look at it. Perhaps Frank could stand on his head and let us know what he sees? :-).

13) Albireo-Double. (Hip. # 95947, and Tyc. # 2133-2964-1) What can be said about Albireo, a Double Star in Cygnus? Not very much I'm afraid. It is one of those objects that does not appear to warrant a lot of respect like the Messier, NGC or other catalogued objects. It is about the best & brightest doubles available to amateurs, & it does belong to a well known constellation, Cygnus or the Swan. And even to my eyes it can resemble a Swan with its wings out stretched. I personally prefer its other name, The Northern Cross. I used to think Albireo was at the tail end of the Swan. Wrong. It seems it is the 'Beak' of the Swan. Which I can see now. Long neck and all. But I'm sure you all knew that. Well maybe not Mario. :-).

Albireo is an easy object most of the year in the

Northern Hemisphere and is nearly smack dab in the middle of the Summer Triangle, (Deneb, Vega & Altair).

Albireo pronounced (al-BURR-ee-oh) is an easy object this time of year South of the Equator although the Swan itself appears to be flying upside down/right side up from the way we in the North view it.

14) Perseus Double Cluster (NGC869 & 884) At just center of the Milky Way between Perseus and Cassiopeia, you'll be fascinated with a splendid pair of open clusters well known as "The Double Cluster". They're drawing close side by side, easily seen by naked eye or binoculars. This pair may prove to be a bit of a challenge for those far South of the equator. But I'm not certain on this.

NGC869 & 884 (H Persei & Chi Persei) are open clusters and each contain over 300 stars. But just as I have found various magnitudes for these clusters, I have also found varying values as to the number of stars in each. I am comfortable with the over 300 stars and between 4&5 mag. for each.

It is sometimes tough to determine where some of the objects we see are. I mean in what constellation. After all, we see the constellations by a few stars that appear to make some kind of shape. While these two clusters do not lie within the stars that form the stick figure "Perseus", they do indeed fall within the 'boundary' of the Perseus constellation. Which is considerably larger than what the stick figure we are used to seeing implies. Same with all constellations. Cassiopeia for example is several times larger than its 5 main stars imply. Like we needed to go into all that eh? Ahh well.

15) Whirlpool Galaxy (M51 / NGC5194) At some 37 million ly +or- a few million (likely closer to 20 million ly IMHO) in the constellation Canes Venatici lies this 8.4 mag. spiral galaxy. And very close by is NGC 5195, an irregular galaxy that appears to have had a close encounter of the unfortunate kind with the much larger Whirlpool.

M51 is the largest of a small group of galaxies known as the M51 group and includes M63 (The Sunflower Galaxy) as well as NGC's 5195, 5023 and 5229 and UGCs 8313, 8331 and 8683.

Amateurs have taken some outstanding images of M51 and its companion.

http://www.seds.org/messier/more/m051_m2.html

In 1994, the HST imaged a Super Nova near the nucleus of M51.

http://www.seds.org/hst/SN1994I.html

I have not been fortunate enough to see this one up close through a larger telescope. I hope many of you get the chance to do so. I think this is one of the finest sights there is.

http://heritage.stsci.edu/public/2001apr/display.html

16) Lagoon Nebula (M8 / NGC6523) A 6th magnitude Diffuse Nebula in the constellation Sagittarius. This Nebula is the birth place and home of the fairly young Open Cluster NGC 6530.

This is another outstanding object well suited to the amateur astrophotographer, easily showing the dark band of dust separating its two bright sections.

At the heart of the Lagoon Nebula in Sagittarius lies the diminutive Hourglass Nebula. This extremely bright object is associated with the blue star alongside it, named Herschel 36 after its discoverer. Herschel described M8 as 'A noble nebula' and 'a fine and complicated nebula', but he was clearly intrigued by the Hourglass which he compared to the nucleus of the Andromeda nebula, M31 as 'decidedly not stellar'.

The tiny bright nebula that captures Herschel's attention is energized partly by the bright star H36 and partly by a star which, for the present, remains hidden in the pinched waist of the Hourglass. The obscured star is only visible in infrared light which can penetrate the thick clouds of dust seen over much of the Lagoon Nebula and clearly evident in a recent Hubble Space Telescope photograph. These stars are probably less than 10,000 years old, about as old as the Hourglass itself, and are evidence of recent star-formation in this very dusty and active region.

http://www.seds.org/messier/more/m008_hst.html

A couple of degrees away from the Lagoon Nebula lies M20 the Trifid Nebula. And closer yet is the Open Cluster M21.

http://www.seds.org/messier/m/m008.html

http://www.seds.org/messier/m/m020.html

http://www.seds.org/messier/m/m021.html

17) Beehive Cluster (M44 / NGC2632) This famous 'Open' cluster is a 3.7 mag. Messier object in the constellation Cancer. M44, is also called Praesepe (Latin for "manger").

Some ancient lore is associated with it: Greeks and Romans saw this "nebula" as the manger (Greek: Phatne) associated with two asses who eat from it, Asellus Borealis, the Northern Ass (Gamma Cnc; Spectral type A1 V, mag 4.7, distance 155 ly) and Asellus Australis, the Southern Ass (Delta Cnc; Spectrum K0 III, mag 3.9, distance 155 ly). Erathosthenes reported that these were the asses on which the gods Dionysos and Silenus rode into the battle against the Titans, who were frightened by the animals' braying so that the gods won. As a reward, the asses were put in sky together with Phatne.

Aratos (260 B.C.) mentioned this objects as “Little Mist”, Hipparcos (130 B.C.) included this object in his star catalog and called it “Little Cloud” or “Cloudy Star”. Ptolemy mentions it as one of seven “nebulae” he noted in his Almagest, and describes it as “The Nebulous Mass in the Breast (of Cancer)”. According to Burnham, it appeared on Johann Bayer’s chart (about 1600 A.D.) as “Nubilum” (“Cloudy” Object).

http://www.seds.org/messier/m/m044.html

It has long been wondered why Messier added this object along with ‘M42, M43 & M45 to his catalogue. There is a good page of a few Messier Questions & Answers that attempts to shed a bit of light on that question. I’ll add just that one question in case some of you prefer not to click the link. The link will get you a few more tidbits.

“Why did Messier include the Orion Nebula, the Pleiades, and Praesepe?

It is somewhat unusual that the Orion Nebula M42 together with M43 and the bright star clusters Praesepe M44 and the Pleiades M45 have found their way into Messiers list; Charles Messier usually only included fainter objects which could be easily taken for comets (this is one reason why the Double Cluster Chi and h Persei is not in Messier’s catalog). But in this one night of March 4, 1769, he determined the positions of these wellknown objects (to say it with Owen Gingerich) ‘evidently adding these as “frosting” to bring the list to 45’, for its first publication in the Memoires de l’Academie (see also the remark at M42).

Interested readers may ask themselves why it was important for him to have his list at 45 rather than 41 objects. One can only speculate on this subject, but perhaps one answer may be that Lacaille’s catalog of 1755 happened to contain 42 entries, and he wanted to beat this number.

One may now ask: Why did he think, in another night, the Andromeda galaxy M31 should be in his list ? You can guess the answer: This object may be easily taken for a fainter (4^{th} mag) comet, even with the naked eye (this may be one of the reasons that it was not cataloged in ancient times, because it was thought to be transient like comets, and as them, regarded as an atmospheric, not astronomical phenomenon).”

http://www.seds.org/messier/m-q&a.html - why_M42-45

Ok right now in Australia in early AM. Better for the coming months as it should be up early to late evening. Easy now and most of year for Northern Hemisphere. Lousy hours though in Aug. & Sept. months if you like to be sleeping between 2 & 7ish AM.

18) Western Veil Nebula (NGC6960), Eastern Veil Nebula (NGC6992) The Veil nebula, also known as the Cygnus Loop, Bridal Veil Nebula & Cirrus Nebula is an enormous region of diffuse gas emission, covering several degrees on the sky. Seen from our perspective against a rich Milky Way star field, the Veil Nebula is now known to lie some 1,400 light-years away toward the constellation Cygnus. At that distance, witnesses to the original stellar explosion would have seen a star in the heavens increase in brightness to about -8 magnitude, roughly corresponding to the brightness of the crescent Moon.

Other portions of this nebula have been given their own NGC designations. The fainter central part is designated NGC 6979.

I hope most of you have the opportunity to see this entire object in the same field of view. It is one of the best and most delicate objects in the night sky.

http://antwrp.gsfc.nasa.gov/apod/ap010928.html

http://antwrp.gsfc.nasa.gov/apod/ap000823.html

Appears to be an easy object all year for Northern Hemisphere. Easy in Southern Hemisphere most of year except maybe for Feb., March. April & May ok for early AM.

19) Omega Centauri (NGC5139) Perhaps the most famous object in Centaurus is Omega Centauri, a splendid globular cluster. Globular cluster are compact roughly spherical clusters of relatively old stars which circle our galaxy.

With the naked eye, Omega appears as a misty patch in the sky, shining at magnitude 3.7, and looking a little like the nucleus of a dim comet but without the tail. Through a telescope it's seen to cover an area the size of the full Moon. Small sized telescopes will show a dazzling spectacle, a myriad of glimmering stars fused to form a slightly flattened disk. Larger telescopes (within a mirror 10 inches in diameter or greater) will resolve the edge of the disk into many thousands of stars spilling out beyond the telescope's field of view. The colours of some of the stars should become visible too, pinpoints of yellow-white light which has raced towards us over the vast distance of space.

http://www.sciencenet.org.uk/astron/const/ConstList/centaurus.html

http://antwrp.gsfc.nasa.gov/apod/ap011010.html

Now this cluster is the largest of the known 200+ Globulars in our Galaxy. But what about an answer to the age old question -----

"Does an old, red globular cluster have any hot, blue stars?" Well ok. Maybe not a question on everyone's mind. But you'll have to click the link to find the answer.

http://antwrp.gsfc.nasa.gov/apod/ap001015.html

Easy object for Australia right now in very early AM. Don't think I can get it from Canada. Unless it really hugs the horizon or I'm reading things wrong.

20) Globular in Sagittarius (M22 / NGC6656) At a magnitude of about 5.1, M22 is one of the closest Globular clusters in our Galaxy at about 10,000 ly (plus or minus.....well you know the drill :-)). The stars in this cluster (about 70,000) are spread over a region roughly 200 light years in diameter. The good news with this cluster is that it is receding from us at 144 km/sec. Well this is good news for folks in the future who will have to deal with galaxies, star clusters and nebula that are speeding towards a date with our neck of the woods. On the bright side however, perhaps a few new planets are on their way. New homes for an ever expanding Earth population?

Don't ask. I have no idea how my mind works.

http://www.seds.org/messier/m/m022.html

http://www.noao.edu/image_gallery/html/im0575.html

Amateur images of M22.

http://www.seds.org/messier/more/m022_m2.html

I believe for this time of year, if you are above 40 degrees North this might be a tough to spot early evening object.

21) Butterfly Cluster(M6 / NGC6405) Burnham calls this open cluster in the constellation Scorpius a "charming group whose arrangement suggests the outline of a butterfly with open wings." The age was estimated to 100 million years according to Burnham, and to 51 million years according to the Sky Catalog 2000. At mag. 5.3 and containing less than 100 stars, it is not the easiest object to spot with the naked eye. But binoculars and any telescope will provide a pleasant view.

Of all Messier objects, M6 is situated at the closest angular distance from the Galactic Center, which is located in the constellation Sagittarius but very near to the 3-constellation edge of Sagittarius, Scorpius and Ophiuchus.

http://www.seds.org/messier/m/m006.html

Nice image showing some of the hottest blue main sequence stars.

http://www.seds.org/messier/more/m006_more.html#noao

22) Double Double - Epsilon Lyra 1 & 2. (HR #'s 7051, 7052 & 7053, 7054 for Lyra 1 & 2 respectively) Epsilon1-Epsilon2 Lyrae: the famous "Double- Double". All four stars are fifth-magnitude. The two principal stars form a very wide binary: PA 173º, separation 208".

Each star is itself a double:

Epsilon1A-Epsilon1B is a slow binary with 1165 year orbit: 5.0, 6.1; PA 350º and separation 2.6".

Epsilon2C-Epsilon2D is about twice as fast, with a period of 585 years: 5.2, 5.5; PA 83.5º, separation 2.3".

Note:

The Lyre (a stringed instrument like a harp) was invented by Hermes as a gift to his half-brother Apollo, who gave it to Orpheus, the musician of the Argonauts. The lyre has been observed to have 7 strings, the same number of naked-eye stars as in the Pleiades. (like you really needed this bit of info. eh? :-).

http://www.astro.wisc.edu/~dolan/constellations/constellations/Lyra.html

This is just interesting:

http://www.astronomy.org.nz/journal/2000/2000_sept/lyra_the_lyre.htm

When done with the Double Double take a short hop over to M56 (globular cluster) & M57 The Ring Nebula (planetary nebula) in the same constellation.

23) Jewel Box(NGC4755) A mag. 4.2 Open Cluster in the constellation Crux. The name says it all for this glorious group of stars.

This cluster was one of the finest open clusters discovered by Abbe Lacaille when he was in South Africa during 1751-1752. This cluster is one of the youngest known, with an estimated age of only 7.1 million years (Sky Catalog 2000).

Situated close to the cluster is a huge dark area of the sky, right within the band of the Milky Way: the Coal Sack. This is a huge dark nebula, probably the nearest at 500 to 600 light years distance, and 60 to 70 light years diameter.

http://www.seds.org/messier/xtra/ngc/n4755.html

Here is a bit on the Coal Sack Nebula.

http://www.seds.org/messier/xtra/ngc/coalsack.html

We in the Northern Hemisphere should make plans for a trip to Australia, South Africa or Zanzibar to get a good view of this gem of a Jewel Box.

24) Blue Snowball Planetary Nebula(NGC7662) Will the Sun one day look like - a blue snowball? Maybe! The Blue Snowball is a planetary nebula - and in 5 billion years the Sun will throw off its outer layers and go through a planetary nebula phase. A star can appear "normal" only so long as there are sufficient nuclear reactions in its core. Soon thereafter, gravity will win out and compress the stellar core to higher temperatures.

http://antwrp.gsfc.nasa.gov/apod/ap961121.html

This planetary nebula in the constellation Andromeda, is similar to the ring nebula. There is a central star which has puffed out its outer layers and then has collapsed to a very very hot dwarf star about the size of Earth!

Planetary nebulae are strange. First, they are gas clouds and have nothing to do with our Solar System's planets.

http://www.phy.mtu.edu/apod/ap961122.html

25 & 27) M66 (NGC 3627), M65 / NGC3623 Two Spiral galaxies in the constellation Leo might be better known as being a part of the M 66 Group or the Leo Triplet. The Triplet includes the Spiral's M66 (NGC3627), M65 (NGC3623) as well as the edge-on spiral NGC 3628.

Messier 66 exhibits a remarkable central bulge. This galaxy shows several anomalies, deviations from "perfect" spiral structure, which can be observed in many galaxies, notably a crack in one of its spiral arms at the lower end of the bright central region and a wave-away of the spiral arm. This is very probably a result of its gravitational interactions with its neighbours M65 and NGC 3628.

http://www.seds.org/messier/more/m066_image.html

M66 is considerably larger than its neighbour, M65, and has a well developed but not well defined central bulge, and is therefore classified Sb.

http://www.seds.org/messier/m/m066.html

Although it is close to and thus under the gravitational influence of its neighbours, M65 looks like a very "normal" Sa type spiral and seems to have felt little influence. It has a prominent central lense and tightly wound spiral arms, plus a prominent dust lane marking the facing edge. The luminous disk is dominated by a smooth old stellar population. Near the lane, some knots are visible, which, according to J.D. Wray, may be associated with star forming regions. The lane may hide regions of star formation usually associated with such features in spiral galaxies.

http://www.seds.org/messier/m/m065.html

Since the edge on spiral NGC 3658, the 3rd object in this triplet might find its way into your fov (if you look real close and have good dark skies) while observing the other 2, you may want to check out a little info on it as well.

NGC 3628 is the faintest and most difficult in the group, just faint enough to have escaped Messier's small telescopes (although it may be that his later instruments might have shown it, if he had ever looked at this place under very good conditions). Thus its discovery was left to William Herschel.

http://www.seds.org/messier/xtra/ngc/n3628.html

And while we are at it, we may as well look at a bit on the Leo Triplet which may actually be a Quadruplet if NGC 3593.

http://www.seds.org/messier/more/m066gr.html

Both of these objects should be easy targets for all. The best if you like to be up all night anyway.

26) Coathanger(CR399) Also known as Brocchi's Cluster; Al Sufi's Cluster; The Coathanger Cluster and resides in the constellation Vulpecula. This Open Cluster may be just an Asterism although studies of the stars motion 'may' suggest it is a cluster. To me it looks like its name suggests, a Coathanger. And that makes it an Asterism.

Messier, the Herschels and the NGC did not assign it a number, probably because of the cluster's size: Even at moderate power, it doesn't match in one field of view, and is best seen in a good pair of binoculars.

Now I don't want to alarm anyone but Collinder 399 was found to be approaching us at 18 km/sec.

http://www.seds.org/messier/xtra/ngc/brocchi.html

This is a good object at decent hours in the Northern Hemisphere. The best times in the Southern Hemisphere I believe are Aug.-Oct. but should be ok before 9 PM right now. If I'm off on the times for any of the objects I hope someone will step in and correct them.

27) Included in #25 above

28) Ptolemy's Cluster(M7 / NGC6475) "M7 is a large and brilliant group, easily detected with the naked eye in the constellation Scorpius. It is also known as The Scorpion's Tail. This splendid cluster was known to Ptolemy who mentioned it about 130 AD, who described it as the "nebula following the sting of Scorpius". The description may also include M6 but this is uncertain. M7 was observed by Hodierna before 1654 who counted 30 stars, and included in Lacaille's catalog of southern objects as Lac II.14.

http://www.seds.org/messier/m/m007.html

In binoculars one might be able to get both M7 & M6 (Butterfly) in the same fov.

Some observations & descriptions handed down through the ages:

http://www.seds.org/messier/Mdes/dm007.html

M7 contains about 100 stars in total, and is dominated by bright blue stars. It is some 200 million years old, spans 25 light-years across, and lies about 1000 light-years away.

http://antwrp.gsfc.nasa.gov/apod/ap000405.html

From what I can find, this object is an ok target for the Southern Hemisphere. It appears the North may have to wait till next spring. But who really wanted to do this all in one night anyway. Of course we could always travel around. Maybe do something like the exchange student thing. Ok. I'll loan my place to whoever from Australia & I'll use their place. Say from now till next March? Just a thought. Would settle for Zanzibar if you don't get any snow. :-).

29) Bernice's Hair Clip (NGC4565) First have a look see at this great looking edge on galaxy in the constellation Comae Bernice:

http://robgendler.astrodigitals.com/4565.html

NGC4565 is one of the brightest and largest galaxies without Messier's numbers scattered around the constellation of Coma Berenices. The galaxy is fairly popular one because it's often quoted as a very typical example of the "edge-on" galaxy. This edge-on galaxy is about 45 million light years away (plus/minus 10 million ly) and has an apparent size in the thickness-direction of only 2 arc minutes, but has a length of more 15 arc minutes, equivalent to the half of an apparent diameter of full-moon.

Note: I have found distance guesstimates ranging from 20-50 million light years. For me, I'll consider it about 30 million till we get better information. This galaxy is moving at the breakneck speed of about 1280 kilometers per second. The good news is that it is speeding away from us. With so many objects coming towards us it is something of a relief to know that a few of the really big ones are going in another direction.

http://www.ne.jp/asahi/stellar/scenes/object_e/ngc4565.htm

Spiral galaxies viewed face-on display a grand design, with graceful spiral arms traced by bright star clusters and glowing stellar nurseries. When seen edge-on, their appearance is very different but no less striking as their central regions bulge and dark cosmic dust lanes appear silhouetted against starlight from flattened galactic disks. This masterful mosaic of digital images shows nine prominent edge-on spirals arranged as follows:

http://antwrp.gsfc.nasa.gov/apod/ap010510.html

This object is an early morning object right now in the Northern Hemisphere. Mid Feb. or so in the Southern Hemisphere if you want to view before midnight. For best viewing North & South of equator I'd wait till Jan. on through the spring.

30) Globular in Pegasus(M15 / NGC7078) A 6.2 mag. Globular Cluster in the constellation Pegasus. Globular cluster M15 is among the more conspicuous of these great stellar swarms. At a distance of about 33,600 light years, its diameter of 12.3 arc min corresponds to a linear extension of about 120 light years.

This globular cluster has the third rank in known variable star population, after M3 and Omega Centauri; a total of 112 variables have been identified. M15 is perhaps the densest of all (globular) star clusters in our Milky Way galaxy. Moreover, globular cluster M15 contains the considerable number of 9 known pulsars, neutron stars which are the remnants of ancient supernova explosions from the time when the cluster was young.

With its apparent visual brightness of magnitude 6.2, M15 is about at the limit of visibility for the naked eye under very good conditions. The slightest optical aid, opera glass or small binoculars, reveals it as a round nebulous object. It appears as a round mottled nebula in 4-inch telescopes, with at best the very brightest stars visible, but otherwise unresolved in a fine star field. In larger telescopes more and more stars become visible the outer parts are resolved, with a more irregular, non-circular outline. The compact core, however, stays unresolved even in large amateur telescopes, but the brightest stars can be glimpsed even there. Chains and streams of stars seem to radiate out of this core in all directions, but less concentrated toward the West.

http://www.seds.org/messier/m/m015.html

The globular cluster M15 contains over 30,000 stars.

The Hubble Space Telescope probed the core of M15, the most tightly packed cluster of stars in our galaxy, to look for evidence of either a massive black hole or another remarkable phenomenon: a "core collapse" driven by the intense gravitational pull of so many stars in such a small volume of space.

http://www.seds.org/messier/more/m015_hst.html

Ok for Northern & Southern Hemispheres.

Note. Just when we thought we dodged a bullet with M15 speeding away from us, in comes this 30,000 star cluster. It is speeding towards us at 112 km/sec. Ah to be around in a billion years or so for all these close encounters of a different kind.

31) Owl Cluster(NGC457) The Owl or ET Open Cluster in the constellation Cassiopeia is near many Messier and NGC clusters and easy any time of the year in the Northern Hemisphere. (It is 'just' above the horizon I believe if you are in Australia, maybe 4 0r 5 degrees, but very tough if not impossible to observe). This cluster is near the star Ruchbah in the 'W' of the Cassiopeia.

Strangely enough, Messier missed this very nice cluster right next door to M103. See if you can see an owl perched on a branch with two bright stars for eyes.

Nice image of the Owl:

http://www.psiaz.com/Schur/astro/IMAGES/ccd/n457-4x5m.jpg

NGC457 is composed of relatively young stars (only about 10 million years old). It is located some 9300 light years from Earth and is about 30 light years across.

http://www.noao.edu/image_gallery/html/im0140.html

32). Milky Way Magnitude-??? -26 to, well let's say +30 or dimmer? . Visible from??? Earth. It has no number like those Messier objects so for want of a better name lets just call it Signori 1 and leave it at that. Or Milky Way is good. :-).

As a galaxy, the Milky Way is actually a giant, as its mass is probably between 750 billion and one trillion solar masses, and its diameter is about 100,000 light years. It is believed that a Super Massive Black Hole resides at the center of our Galaxy. Although I have a problem with some of the theory of the exact composition and structure of Black Holes, I do now believe that something has to be at the center of many galaxies to account for the amount of mass (billions of solar masses) in such a small area of space.

The Milky Way Galaxy belongs to the Local Group, a smaller group of 3 large and over 30 small galaxies, and is the second largest (after the Andromeda Galaxy M31) but perhaps the most massive member of this group. M31, at about 2.9 million light years, is the nearest large galaxy, but a number of faint galaxies are much closer: Many of the dwarf Local Group members are satellites or companions of the Milky Way. The closest of all is above-mentioned SagDEG at about 80,000 light years from us and some 50,000 light years from the Galactic Center, followed by the more conspicuous Large and Small Magellanic Cloud at 179,000 and 210,000 light years, respectively.

Note that the above statement suggests that Andromeda may be larger but less 'Massive' than the Milky Way.

http://www.seds.org/messier/more/mw.html

A Cobe satellite image of the central bulge of our Galaxy:

http://www.seds.org/messier/more/mw_cobe.html

The Milky Way Near the Northern Cross:

http://antwrp.gsfc.nasa.gov/apod/ap960515.html

The Milky Way Near the Southern Cross

http://antwrp.gsfc.nasa.gov/apod/ap960503.html

Sagittarius and the Central Milky Way

http://antwrp.gsfc.nasa.gov/apod/ap960605.html

Since the galaxy rotates, the Sun "orbits" the centre, taking 200 million years to complete one circuit.

http://www.star.le.ac.uk/edu/mway/

It is interesting to note that astronomers capitalize the "G" in galaxy when talking about our Milky Way! I also try to remember to do that when talking about our Galaxy.

As mentioned above, we have our own little group of galaxies known as the Local Group. Our little Local Group is part of a much larger swarm Known as the Virgo Supercluster. Or Virgo-Coma Supercluster. This group has well over 2000 member galaxies. It appears probable that the Local Group will finally fall and merge into, or be "eaten" by the Virgo Cluster. Virgo Supercluster:

The name given to the local supercluster because it is dominated by the large Virgo cluster. Our own local group of galaxies lies near one end of the supercluster. By cosmological standards, the Virgo supercluster is a fairly small example of a supercluster.

http://www.seds.org/messier/more/virgo.html

We could go on for a long time about our Galaxy. But we shall end it here. I'll leave you with one more little interesting bit about The Neighbouring Superclusters:

http://anzwers.org/free/universe/superc.html

33) Trapezium in Orion(Center of M42) Below Orion's belt is a fuzzy area known as the Great Nebula of Orion or M42. In this nebula is a bright star cluster known as the Trapezium. New stellar systems are forming there in gigantic globs of gas and dust known as Proplyds (protoplanetary disks).

http://antwrp.gsfc.nasa.gov/apod/ap971118.html

The Trapezium is the most famous multiple star system in the entire night sky.

Located at the very heart of M42, the Orion Nebula, it is one of the youngest clusters known. It involves four bright stars (A, B, C and D) that are easily visible in any sized telescope with decent optical quality.

The Trapezium is a star cluster that consists of about 1,000 young, hot stars that are only 1 million years old. They are crowded into a space about 4 light years in diameter, the same distance between the Sun and Proxima Centauri, our nearest neighbour star.

Most of the stars in the cluster are hidden by dust or in the light of the nebula.

http://www.astropix.com/HTML/B_WINTER/TRAPEZ.HTM

http://www.ast.cam.ac.uk/HST/press/aas97D.html

http://www.seds.org/messier/more/m042_hst3.html

The five main young and massive Trapezium stars are responsible for the illumination of the entire Orion Nebula. These stars are born with masses 15 to 30 times larger than the mass of our sun. X-rays in such stars are thought to be produced by shocks that occur when high velocity stellar winds ram into slower dense material.

The Chandra spectra show a temperature component of about 5 million to 10 million degrees, which is consistent with this model. However, four of these five stars also show additional components between 30 million and 60 million degrees.

http://chandra.harvard.edu/press/00_releases/press_110900.html

Whenever you can see Orion the Hunter you'll be able to see the Trapezium.

34) Open Cluster in Puppis (M46 / NGC2437) M46 was the first object Messier discovered after he had published the first edition of his list (M1-M45), on February 19, 1771, three days after presenting it to the academy. It is a fairly rich 6.0 mag. Open Cluster in the constellation Puppis with a total population of over 500. A planetary nebula (NGC 2438, also FC 87) appears within the apparent borders of M46. This object appears to lie near the northern fringes of the cluster. However, this nebula is most probably not a true member but is superimposed, or perhaps a passing "guest".

http://www.seds.org/messier/m/m046.html

Galactic or open star clusters are relatively young. These swarms of bright stars are born near the plane of the Milky Way, but their numbers steadily dwindle as cluster members are strewn through the Galaxy by gravitational interactions.

http://antwrp.gsfc.nasa.gov/apod/ap990305.html

A little more than a degree away in the same constellation lies the smaller but brighter (mag. 4.4) Open Cluster M47.

35) Double Triangle (Star Gate) HIP 61466 Hmmmmm. This one is tough. I can't find much of anything about this object so I'm going to let you know what I think I know about it. Which is not much. The HIP 61466 is one of the stars in this 6 star grouping. It is situated within the boundaries of the Constellation Corvus above the star 'Algorab' in the 'sail'. This Asterism has 3 stars forming a small triangle within a larger triangle of 3 stars. Let's see. I know. Have a look with binoculars or scope and see if you can spot something like that near Corvus. If I run across some better stuff on it I'll pass it along.

36) 24 Com. (24 Comae Berenices, HIP 61418) The stars that form the constellation Comae Berenices really aren't that remarkable to look at, only a handful of fourth-magnitude stars, including three Bayer stars. Yet there are several fine binaries, eight Messier objects and the Coma Star cluster, not included in Messier's list.

Of the several binary systems within this constellation 24 Comae is probably the most spectacular: A fixed binary with an orange primary and emerald component. I have heard blue and orange but I like Emerald. I have not seen this double so can't say for sure.

A large pair of binoculars is likely the least one would need to attempt to split this system. A telescope would make the task much simpler.

I know we should stick to the main object which in this case is 24 Comae but the story is good about the constellation is great for folks of all ages.

First of all, Comae Berenices translates to 'Berenices Hair after Berenice, the wife of Ptolemy III of Egypt. While the story is an old one, the constellation is relatively new, being introduced by Tycho Brahe (1546-1601).

According to the story, Ptolemy had waged a long war on the Assyrians, since it was they who had killed his sister. As Ptolemy returned successfully from the war, his wife Berenice had her beautiful tresses ceremoniously clipped and given to Aphrodite, laid out on the temple altar.

As the evening's festivities continued, the shorn hair was discovered to be missing. The priests might be sacrificed, if the queen's hair couldn't be found. (some thought Venus may have stolen the locks but since that was before my time I can't be sure). It was the astronomer Conon of Samos who came to their rescue - proclaiming that Aphrodite had accepted the gift of Berenice's hair, which now shone brightly in the heavens next to Leo.

There are different variations to the story but this gives the general idea.

http://www.dibonsmith.com/com_con.htm

This object can be seen in the Northern Hemisphere right now if you don't mind the early morning hours. Best times are Spring & Summer. Poor hours in the Southern Hemisphere as well (Perth Australia is where I refer to). Better hours beginning in Jan.

37) Open Cluster in Sagittarius(M25 / IC 4725) You will probably need binoculars to spot this mag. 6.5 Open Cluster in Sagittarius. This cluster contains at least 86 probable members and is about 2,000 light years away.

http://www.seds.org/messier/m/m025.html

This cluster is towards our Galactic center, rich in nebula and clusters including Open star clusters M6, M7, M18, M21, M23, M24, M25. And don't forget Baade's Window. If you are in the area anyway, you might as well look around at the abundance of other objects. Sort of like one stop shopping.

http://antwrp.gsfc.nasa.gov/apod/ap990911.html

38) Open Cluster in Gemini(M35 / NGC2168) In dark skies you should be able to spot this 5.2 mag. Open Cluster in the constellation Gemini. Unless you are my age then I'd suggest binoculars so you don't put too much of a strain on the eyes.

Within an age of about 110 million years, it is of intermediate age, and contains some post-main sequence stars (including several yellow and orange giants. It contains over 200 stars and is about 2,300 ly away. +/- a few hundred IMHO.

The slightest optical instrument will resolve the brighter stars and make it a splendid view at low magnifications, a nearly circular cluster with rather uniform stellar distribution.

Amateurs with more powerful telescopes can view its fainter neighbor, NGC 2158.

http://www.seds.org/messier/m/m035.html

An interesting image taken of a Leonid meteor last Nov. by Bob Yen is seen passing near such night sky notables as galactic star cluster M35, and Taurus's brightest star, red giant Aldebaran.

http://antwrp.gsfc.nasa.gov/apod/ap001124.html

39) Open Cluster in Cepheus(NGC7510) NGC7510, is magnitude 7.9 and definitely requires optical aid. This open cluster contains about 100 stars. I believe this cluster contains several doubles and a couple of triples but I don't know how easy they are to resolve. NGC7510 is a circumpolar object available all year in the Northern Hemisphere. I don't believe it is available to those in the Southern Hemisphere. At least I don't think so for those as far South as Australia.

40) Globular Cluster in Hercules(M92 / NGC6341) M92 is a splendid object, visible to the naked eye under very good conditions and a showpiece in any optical instrument. When it come to star clusters I really enjoy the globulars over the open variety. Sort of like seeing small galaxies.

Interesting trivia on M92: As the ecliptical coordinates for M92, Longitude = 249.9 deg, Latitude = 65.9 deg, indicate, the Earth's North Celestial Pole occasionally passes closer than 1 degree of this cluster, at periods of the precession of Earth's axis (about 25,800 years). So this cluster becomes a "Polarissima Borealis", or "North Cluster", in about 14,000 years (16,000 AD), as it was about 12,000 years ago (10,000 BC).

As much has I like globulars for their large numbers of stars there is a bit of a downside with this one. It appears to be heading in our direction at 112 km/sec. That's like over 330,000 pretty large suns heading for a showdown with our neck of the woods. Just when you thought it would be safe to go out and play eh. Ahhh well.

http://www.seds.org/messier/m/m092.html

Amateur images of M92:

http://www.seds.org/messier/more/m092_m2.html

41) 47 Tucanae(NGC104) Stars come in bunches. Of the over 200 globular star clusters that orbit the center of our Milky Way Galaxy, 47 Tucanae is the second brightest globular cluster (behind Omega Centauri). Known to some affectionately as 47 Tuc or NGC 104, it is only visible from the Southern Hemisphere. Light takes about 20,000 years to reach us from 47 Tuc which can be seen near the SMC in the constellation of Tucana.

http://antwrp.gsfc.nasa.gov/apod/ap970919.html

The stars of 47 Tucanae are spread over a volume nearly 120 light years across. At their distance of 13,400 light years, they still cover an area of the sky of about the same apparent diameter as the full moon, about 30 minutes of arc.

Globular cluster 47 Tucanae is approaching us at roughly 19 km/s.

http://www.seds.org/messier/xtra/ngc/n0104.html

http://www.astr.ua.edu/gifimages/47tuc.html

Although thousands of stars make up the cluster, the brightest are only eleventh-magnitude. Thus it takes a medium to large sized telescope to begin to resolve its individual members.

It is unfortunate that we in the Northern Hemisphere can't see this great Globular. But it is a must see object along with the Large & Small Magellanic Clouds if we are ever visiting the South.

42) Galaxy in Andromeda(NGC891) NGC891 is a small galaxy in Andromeda, positioned at about 4 degrees east of gamma Andromedae. The galaxy is being edge-on with clearly distinguished dust-lane in

large telescopes. The large dust lane that bisects the galaxy is composed of dust and gas. It blocks the light from the billions of stars that populate this region.

Nice images of this galaxy that is believed to have similarities to our own Milky Way Galaxy:

http://www.noao.edu/image_gallery/html/im0002.html

The constellation Andromeda is home to the brightest galaxy in the night sky, M31, but an 8" scope should easily reveal the dust lane that bisects this edge-on spiral galaxy. NGC891 is located some 30 million light-years away. +or- a few million IMHO.

In case anyone is wondering, NGC891 is not a member of our Local Group of Galaxies. The members are listed here:

http://www.seds.org/messier/more/local.html

43) Open Cluster in Ophiuchus (NGC6633) This loose , bright cluster stands out against the Milky Way's background even in binoculars. Although this cluster is a respectable 4.6 mag. object, the brilliance of the Milky Way might make it tough to make out with the naked eye unless you are under darker sky conditions. Or maybe this is only true with somewhat older eyes.

This cluster is nearly as large as the full moon, and contains 30 stars which make it shine at a total magnitude of 4.6; the brightest star is of mag 7.6. Its age was estimated at 660 million years.

http://www.seds.org/messier/xtra/ngc/n6633.html

Although this object is best viewed in the summer/fall months in the Northern Hemisphere, you may still catch it before it sets around 9 PM. Southern Hemisphere observers will have this object at reasonable hours (before midnight) by April. If skies are dark in your area you should be able to catch it before 8PM now.

44) Galaxy in Coma Berenices (M100 / NGC4321) The galaxy M100 is one of the brightest members of the Virgo Cluster of galaxies. Virgo Cluster info:

http://www.seds.org/messier/more/virgo.html

The galaxy is in the spring constellation Coma Berenices and can be seen through a moderate-sized amateur telescope. M100 is spiral shaped, like our Milky Way, and tilted nearly face-on as seen from earth. The galaxy has two prominent arms of bright blue stars and several fainter arms. The blue stars in the arms are young hot and massive stars which formed recently from density perturbations caused by interactions with neighbouring galaxies.

Amateurs can see the central regions of this galaxy as faint elliptical patch of uneven texture in small telescopes, or even in good binoculars. Under good observing conditions, suggestions of the inner spiral arms can be glimpsed in telescopes starting at 4 inch aperture (refractor or unobstructed reflector). Photos reveal the grand design spiral structure, as seen in every picture from our collection of amateur images of M100.

http://www.seds.org/messier/more/m100_m2.html

Deep photographs of M100 have revealed that this galaxy is actually much larger than shown in conventional photographs. Therefore, a significant part of the galaxy's mass may lie in the faint outer regions and escape its discovery in conventional images.

http://www.seds.org/messier/more/m100_deep.html

http://www.seds.org/messier/m/m100.html

Majestic on a truly cosmic scale, M100 is appropriately known as a Grand Design spiral galaxy.

http://antwrp.gsfc.nasa.gov/apod/ap010203.html

Since you were in the neighborhood with 24 Comae it would only be natural to want to try and bag this beauty at the same time. And while they are not on the list you may want to take a bit of a break and check out several other Messier objects in the same constellation:

M53 (globular cluster)
M64 The Blackeye Galaxy (spiral galaxy)
M85 (elliptical galaxy)
M88 (spiral galaxy)
M91 (spiral galaxy)
M98 (spiral galaxy)
M99 (spiral galaxy)

Ok in Southern Hemisphere right now if you don't mind the early AM times. More decent hours starting in Jan/Feb. Early Morning as well in Northern Hemisphere. Much better earlier times starting late Dec./Jan.

45) Table of Scorpius(NGC6231) Ahhh an easy to spot 2.6 mag Open Cluster in the constellation Scorpius. And as an added attraction you will get the Nebula IC4628 in the same fov. Should almost have been a 2 for one member of the Nexstar 50.

NGC 6231 has been one of the discoveries of Giovanni Batista Hodierna, published in his 1654 catalog in Palermo, but forgotten until its rediscovery in the early 1980s. It was independently rediscovered by Philippe Loys De Cheseaux 1745-46 and by Abbe Lacaille in 1751-52.

Now that above statement sounds a little strange I know. I mean the part about being forgotten till the early 1980's. But I found the same on 3 different sites. I wonder if they mean 1980's? If anyone knows for sure let us know. Perhaps the speed at which it is approaching us is considerably greater than the 22 km/sec previously thought. Like maybe 2200 km/sec. That would explain it's sudden reappearance. You think?

My how we seem to get off track when we are having so much fun.

This cluster is extremely young, and was estimated only about 3.2 million years old.

http://www.seds.org/messier/xtra/ngc/n6231.html

Nice image of both the cluster & nebula:

http://www.abmedia.com/astro/dsc2/ic4628.html

I'm sure there is a reason why this is called the 'Table of Scorpius' but I was not able to find any reference to it. Perhaps I did not try hard enough. I did find a reference suggesting it was the Scorpius Jewelbox .

http://www.visualdeepsky.org/netastrocatalog/msg01507.html

46) Trifid Nebula(M20 / NGC6514) I love this Nebula. It's not my favourite but it is one that looks like something different every time I look at an image of it. I have not had the opportunity of seeing it in a larger scope.

The Trifid Nebula M20 is famous for its three-lobed appearance. This may have caused William Herschel, who normally carefully avoided to number Messier's objects in his catalog, to assign four different numbers to parts of this nebula. That he numbered this object at all may have its reason in the fact that Messier merely described it as 'Cluster of Stars'. The name 'Trifid' was first used by John Herschel to describe this nebula.

The dark nebula which is the reason for the Trifid's appearance was cataloged by Barnard as Barnard 85 (B 85).

The red emission nebula with its young star cluster near its center is surrounded by a blue reflection nebula which is particularly conspicuous to the northern end.

As with most Nebula, (and most distant objects IMHO) the distance if M20 is pretty uncertain, ranging from 2,200-9,000 ly. Regardless of the distance, it is still only a binocular (good ones) or telescope object at mag. 9.0. However here again one can bag 2 for the price of one. Close to M20 is the larger mag. 6.0 Lagoon Nebula, M8.

http://www.seds.org/messier/m/m020.html

These amateur images show very nicely the red emission nebula with its young star cluster near its center and surrounded by a blue reflection nebula:

http://www.seds.org/messier/more/m020_m2.html

As does this professional image:

http://antwrp.gsfc.nasa.gov/apod/ap000328.html

These of both the Trifid & Lagoon:

http://www.seds.org/messier/more/m008-020_more.html

Starbirth in the Trifid Nebula:

http://antwrp.gsfc.nasa.gov/apod/ap990607.html

47) Betelguese (Named Star) Here it is. Maybe not the largest star in the Universe but my personal favourite. This red super giant resides in a place of honour, the top left shoulder of the great constellation "Orion the Hunter".

The luminosity of the star is about 10,000 times that of the sun. The diameter of the star is about 650 times the diameter of the sun. According to Burnham the star fluctuates irregularly in brightness over a period of years and has been seen to vary by up to a factor of two in luminosity. Betelgeuse is also pulsates irregularly in size. Burnham suggests that the diameter of the star may vary as much as 60%. If the sun were replaced by Betelgeuse, the surface of the star might stretch out beyond the asteroid belt. The planets out to the orbit of Mars would be engulfed by the star. Betelgeuse is a massive star as well. It may contain as much as 20 times the mass of the sun. Because of its large mass, Betelgeuse is a star that will run through its life history fairly quickly. The star has already consumed the bulk of its hydrogen fuel in the core and is on the way to stellar graveyard. Betelgeuse is losing mass at reasonably rapid rate. It is estimated that within a few hundred thousand years Betelgeuse will eject about one solar mass of material.

The Hubble Space Telescope took the first direct picture of the surface of a star other than the Sun. This is the image captured by Hubble of Betelguese:

http://antwrp.gsfc.nasa.gov/apod/ap990605.html

http://www.seds.org/hst/Btlgeuse.html

Scale of the size of the star compared to Earths & Jupiters orbits:

http://ftp.seds.org/pub/images/hst/Btlgeuse.jpg

Betelguese has an Absolute Magnitude of about -6.0. Absolute mag. is how bright an object would appear if placed at a standard distance of 10 parsecs (32.6 light-years). Rigel, another star in Orion would blaze at about -8.0, nearly as bright as the quarter Moon. Our Sun would would shine at an unimpressive visual magnitude 4.85.

On the one hand, a few stars shinning at about -6.0 would look great. On the other hand, these stars would make observing other deep sky objects near or virtually impossible.

48) Globular in Sagittarius (M55 / NGC6809) The published values for M55's magnitude vary from mag 5 to 7. Its total luminosity may be near 100,000 times that of the Sun.

http://www.seds.org/messier/m/m055.html

M55 is a large and lovely globular cluster of around 100,000 stars. Only 20,000 light-years away in the constellation Sagittarius, M55 appears to earth-bound observers to be nearly 2/3 the size of the full moon.

http://antwrp.gsfc.nasa.gov/apod/ap000922.html

An interesting M55 Color Magnitude Diagram:

http://antwrp.gsfc.nasa.gov/apod/ap010223.html

This object is easy in the Southern Hemisphere right now after sunset. I think it will be ok in the Northern Hemisphere at a reasonable late night hour next beginning next June.

49) Open Cluster in Auriga(M36 / NGC1960) This is the first of three bright open clusters in the southern part of constellation Auriga, included in Messier's catalogue (the other two are M37 and M38).

Under very dark skies, younger eyes might be able to barely see this mag. 6.3 cluster but any optical aid should make it an easy target.

M36 has about 60 proven member stars and is somewhere between 3,600-4,200 ly away. + or - a few. As it is quite young (about 25 million years), it contains no red giants, in contrast to its neighbours M37 and M38, which lie roughly at the same distance.

http://www.seds.org/messier/m/m036.html

An image of the three open clusters in Auriga, M36, M37, and M38.

http://www.seds.org/messier/more/m036-037-038_more.html

A bit about the constellation Auriga:

"Auriga was portrayed as a charioteer who was seen carrying two to three children on his arm. He was also known as Erechtheus, son of Hephaestus (Called Vulcan by the Romans). Hephaestus, who was crippled as a child, was believed to have invented the chariot for his who created it so that his son could move him about more easily."

I know. We really did not need to know that. What can I say. :-).

M36 is easy now till about Feb. in the Northern Hemisphere at decent hours. But is pretty much an all year object if you don't mind the wee hours of the AM at certain times. It also appears to be an ok object for the Southern Hemisphere right now.

50) Eagle Nebula & Cluster(M16 / NGC6611) Lying some 7,000 light years distant in the constellation Serpens, and in the next inner spiral arm of the Milky Way galaxy from us, a great cloud of interstellar gas and dust has entered a vivid process of star formation. Open star cluster M16 has formed from this great gaseous and dusty cloud, the diffuse Eagle Nebula IC 4703, which is now caused to shine by emission light, excited by the high-energy radiation of its massive hot, young stars. It is actually still in the process of forming new stars.

Here again we have an object just outside our naked eye range. But in this case that is ok because we want to get the glorious view of the grand Eagle Nebula.

While De Cheseaux, in 1745-6, only discovered the cluster, Charles Messier, on his independent rediscovery of June 3, 1764 mentions that these stars appeared "enmeshed in a faint glow", probably suggestions of the nebula. The Herschel's apparently didn't perceive the nebula, so that their catalogs and consequently, the NGC, only describe the cluster. The nebula was added in the IC II of 1908 as IC 4703, with "cluster M16 involved", but the NGC 2000.0 erroneously classifies this object as an open cluster.

Even the Herschel's and the NGC 2000.0 made errors or omissions? I'm thinking that any of you who have seen these 'two' objects do actually see the cluster and nebula. I'm also thinking that even with our 3"-14"+ scopes, we may find something that has been previously overlooked. But I digress. (no I don't know the definition of digress. Seemed like the right place to use it though).

http://www.seds.org/messier/m/m016.html

Eagle EGGs in M16:

Star forming regions known as "EGGs" are uncovered at the end of the giant pillar of gas and dust in the Eagle Nebula (M16). EGGs, short for 'Evaporating Gaseous Globules', are dense regions of mostly molecular hydrogen gas that fragment and gravitationally collapse to form stars. Light from the hottest and brightest of these new stars heats the end of the pillar and causes further evaporation of gas - revealing yet more EGGs and more young stars.

http://antwrp.gsfc.nasa.gov/apod/ap010812.html

M16: Stars from Eagle's EGGs

http://antwrp.gsfc.nasa.gov/apod/ap000924.html

http://antwrp.gsfc.nasa.gov/cgi-bin/apod/apod_search?m16

I must be reading some setting wrong. M16 does not appear to be an object that will be an easy target till late next spring in both hemispheres. At least not at decent hours for most. Best check with your own sky charts or planetariums for both of today's objects.

And this brings to and end our little look at the Nexstar 50 List. I hope a few read something new. I hope some read something they had long forgotten. And I hope it did not annoy too many.

Not a single one of us any chance at all of ever discovering a new comet or asteroid or making some other new discovery. Not a single one of us can tell our children, family or friends what any object in the night sky really looks like and sound like we know what we are talking about. Not a single one of us will know very much reading from a computer screen or looking at Hubble images. Not a single one of us will be able to do any of that unless we put our eyes into the eyepiece of our telescopes or binoculars. Don't have your instruments with you? Look up anyway from time to time. It's worth more than the quarter we might find looking at the ground.

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Authors & editors: Robert Nemiroff (MTU) & Jerry Bonnell (USRA)
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A service of: LHEA at NASA/ GSFC &: Michigan Tech. U.

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M 42

Diffuse Nebula *M42 (NGC 1976)*, an emission and reflection nebula, in Orion

Orion Nebula

Right Ascension	05 : 35.4 (h:m)
Declination	-05 : 27 (deg:m)
Distance	1.6 (kly)
Visual Brightness	4.0 (mag)
Apparent Dimension	85x60 (arc min)

Discovered 1610 by Nicholas-Claude Fabri de Peiresc.

Located at a distance of about 1,600 (or perhaps 1,500) light years, the Orion Nebula is the brightest diffuse nebula in the sky, visible to the naked eye, and rewarding in telescopes of every size, from the smallest glasses to the greatest Earth-bound observatories and the Hubble Space Telescope.

It is the main part of a much larger cloud of gas and dust which extends over 10 degrees well over half the constellation Orion. The linear extend of this giant cloud is well several hundreds of light years. It can be visualized by long exposure photos (see e.g. Burnham) and contains, besides the Orion nebula near its center, the following objects, often famous on their own: Barnard's Loop, the Horsehead Nebula region (also containing NGC 2024 = Orion B), and the reflection nebulae around M78. Already impressive in deep visible light photographs, the Orion Cloud is particularly gorgeous in the infrared light.

The Orion Nebula itself is still a *big* object in the sky, extending some 66x60 arc minutes, thus covering four times the area of the full Moon. This corresponds to a linear diameter of about 30 light years. It is also one of the brightest Deep Sky objects, well visible to the naked eye, so that the present author is wondering that its nebulous nature was apparently not documented before 1610, when Nicholas-Claude Fabri de Peiresc (1580-1637), a French lawyer, turned his telescope to this region of the sky (although

Ptolemy, as well as later Tycho Brahe and Johann Bayer had cataloged the brightest stars within it as one bright star - the latter cataloging it as Theta Orionis, and Galileo had detected a number of faint stars when first looking at this region with his telescope earlier in 1610). It was independently rediscovered in 1611 by the Jesuit astronomer Johann Baptist Cysatus (1588-1657) of Lucerne who compared it with a comet he had observed in the same year. The first known drawing of the Orion nebula was created by Giovanni Batista Hodierna. All these discoveries apparently got lost for some time, so that eventually Christian Huygens was longly credited for his independent rediscovery in 1656, e.g. by Charles Messier when he added it to his catalog on March 4, 1769.

As the drawings of the Orion Nebula known to him did so poorly represent Messier's impression, he created a fine drawing of this Object, in order to "help to recognize it again, provided that it is not subject to change with time" (as Messier states in the introduction to his catalog).

This gorgeous object continued influence astronomers since. It was the first deepsky observation by William Herschel with a self-constructed reflecting telescope of 6-foot focal length in 1774. In 1789, with some prophetic touch, he described his observations with his 48-inch aperture, 40-foot FL scope as "an unformed fiery mist, the chaotic material of future suns." In 1880, M42 was the first nebula to be successfully photographed, by Henry Draper.

The nebula, on its northern end, is devided by a conspicuous dark lane, well visible in our photograph. This image was obtained David Malin of the Anglo-Australian Observatory. More information on this image is available.

The small northeastern portion was first reported by de Mairan, and was given an extra number by Charles Messier, M43 (see below also). In the very neighborhood, to the north, there are also fainter reflection nebulae, partially reflecting the light of the Great Nebula. They were not notable for Charles Messier, but labeled later with the NGC numbers 1973-5-7. Here we have a collection of more images of M42, M43, and more images of M42, M43 and NGC 1973-5-7.

M42 itself is apparently a very turbulent cloud of gas and dust, full of interesting details, which C.R. O'Dell compares to the rich topography of the Grand Canyon in his HST photo caption. The major features got names on their own by various observers: The dark nebula forming the lane separating M43 from the main nebula extends well into the latter, forming a feature generally nicknamed the "Fish's Mouth". The bright regions to both sides are called the "wings", while at the end of the Fish's Mouth there's a cluster of newly formed stars, called the "*Trapezium cluster*". The wing extension to the south on the east (lower left in our image) is called "The Sword", the bright nebulosity below the Trapezium "The Thrust" and the fainter western (right) extension "The Sail". Here we have a small collection of Images of detail in M42, including another nomenclature for the brightest region in the nebula by historic visual observers, as well as a pictorial study of the Trapezium cluster and region by Lowell Observatory images.

The Trapezium cluster is among the very youngest clusters known, with new stars still forming in this region. The cluster was first depicted as triple star apparently by Hodierna before 1654 (see his drawing), and first described by Christian Huygens in 1656 when he indepedently rediscovered the Orion nebula. These first three stars are often labelled "A", "B", and "C". At this time, this was apparently the second recognized multiple star (after Mizar in Ursa Major which had been found to be a telescopic double in 1650). The fourth Trapezium star, "D", was first found by Abbe Jean Picard in 1673 (according to de Mairan), and independently by Huygens in 1684. The fifth cluster star "E" was discovered by Friedrich Georg Wilhelm Struve in 1826 with a 9.5-inch refractor in Dorpat, the sixth, "F", by John Herschel on February 13, 1830, the seventh, "G", by Alvan Clark in 1888 when testing his 36-inch refractor of Lick Observatory, and the eighth, "H" by E.E. Barnard later in 1888 with the same telescope. Barnard later found that "H" is double, with two 16th-magnitude components. Today we know that stars "A" and "B" are both eclipsing variables of Algol type: A varies between magnitudes 6.73 and 7.53 with a period of 65.4325 days, while B varies between mag 7.95 and 8.52 in 6.4705 days.

The Orion Nebula is also one of the easiest and most rewarding target for amateur astrophotographers.

The past decades of research on the Orion Nebula have revealed that the visible nebula, M42, the blister of hot, photo-ionized, luminous gas around hot Trapezium stars, is only a thin layer lying on the surface of a much larger cloud of denser matter, the Orion Molecular Cloud 1 (OMC 1). We happen to see this structure approximately face-on. The idea for this model came originally from Münch (1958) and Wurm (1961) and fully elaborated by several authors around 1973-1974 (Zuckerman (1973), Balick *et.al.* (1974)), soon supported by evidence, and is still studied in detail, see e.g. O'Dell (2001) for a recent review, and references cited therein. The San Diego Supercomputer Center (SDSC)'s VisLab has created a 3-dimensional visualization of the Orion Nebula based on this model (see side-view model image of M42).

The Orion nebula was, continuously since the early times before its refurbishment, a preferred target for the Hubble Space Telescope. One major discovery was that of protoplanetary disks, the socalled "*Proplyds*" (planetary systems in formation) in these HST images of M42 (these images were used for an animation simulating the approach to a protostar [caption]). HST images of November 1995 have revealed further insight into the complicated process taking place in this "star factory". Hubble investigations of January 1997 have revealed interesting interactions of the young hot Trapezium cluster stars with the protoplanetary disks: Their violent radiation tends to destruct the discs, so that the lower-mass stars forming here may loose the material needed to form planetary systems.

It is very easy to find the Orion Nebula, as it surrounds the Theta Orionis multiple star or cluster, seen to the naked eye in the middle of the sword of Orion. Already under fairly good conditions, the nebula itself can be glimpsed with the naked eye as a faint nebulosity around this star.

It is somewhat unusual that the Orion Nebula has found its way into Messier's list together with the

bright star clusters Praesepe M44 and the Pleiades M45; Charles Messier usually only included fainter objects which could be easily taken for comets. But in this one night of March 4, 1769, he determined the positions of these wellknown objects, (to say it with Owen Gingerich) `evidently adding these as "frosting" to bring the list to 45', for its first publication in the *Memoires de l'Academie* for 1771 (published 1774). One may speculate why he prefered a list of 45 entries over one with 41; a possible reason may be that he wanted to beat Lacaille's 1755 catalog of southern objects, which had 42 entries. Messier measured an extra position for a smaller northeastern portion, reported by de Mairan previously, which therefore has the extra Messier number: M43.

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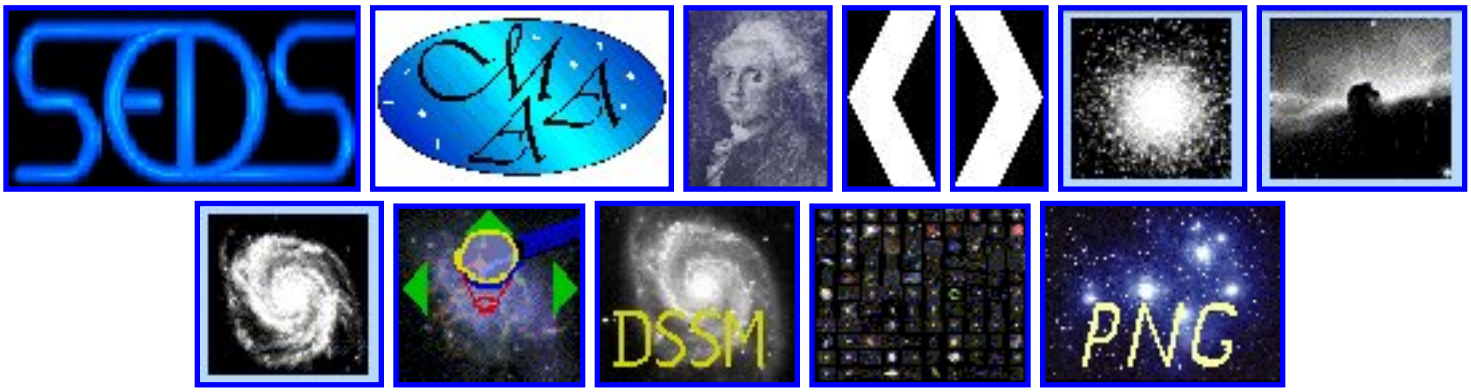

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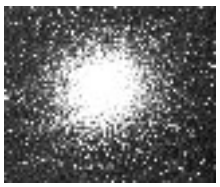

Messier 13

Observations and Descriptions

Discovered by Edmond Halley in 1714.

Messier: **M13**.

June 1, 1764. 13. "A nebula without a star, discovered in the belt of Hercules; it is round & brilliant, the center is more brilliant than the edges, one perceives it with a telescope of one foot [FL]; it is near two stars, both of 8th magnitude, the one above and the other below it: the nebula's position was determined by comparison with Epsilon Herculis. M. Messier has reported it on the chart of comet of 1779, which was included in the volume of the Academy of that year. Seen by Halley in 1714. Seen again Jan. 5 and 30, 1781. It is reported in the English *Celestial Atlas*." (diam. 6')

Halley: **No. 6, Nebula in Hercules**

The Sixth and last was accidentally hit upon by M. *Edm. Halley* in the Constellation of *Hercules*, in the Year 1714. It is nearly in a Right Line with Zeta and Eta of Bayer, somewhat nearer to Zeta than to Eta: and by comparing its Situation among the Stars, its Place is sufficiently near in [Scorpio] 26 deg 1/2 with 57 deg 00. North. Lat. This is but a little Patch, but it shews it self to the naked Eye, when the Sky is serene and the Moon absent.

De Chéseaux: **De Ch. No. 21**.

"I haven't yet found that in Hercules, which was discovered by M. Halley. I strongly wish that the astronomers at Paris would like to indicate me its place."

Bode: **Bode 30**.

"A rather vivid nebula."

"On September 9 [1774], with the 7-foot telesope, I found a very distinguishable nebulous star in Hercules between Eta and Zeta, which shows up as a rather vivid and round nebulous patch, which has a bright nucleus in its center. Actually, it is situated between two small stars, and is separated from the Northern one by 17.25' and from the Southern one by 16.75', as the third figure shows. From the star Zeta, I find with the heliometer a separation of 4deg 59', from Eta 2deg 29',

from Pi 6 deg 43', and from d 4deg 57'. Iz was only partially known to me at that time that *Halley* has observed a nebulous star in Hercules, and later I read in the Philosophical Transactions of the year 1716 that he had observed it in the year 1714 between Eta and Zeta at about 236 deg [ecliptical longitude] and 57 deg northern [ecliptical] latitude; therefore, it has to been assumed that this must be the same one. Meanwhile *Halley* writes that the nebula is a bit closer to the star Zeta than to Eta. As I now find that it is situated [much] closer to the star Eta than to Zeta, I don't know another reason responsible for this remarkable difference than a typing error at *Halley*, or his inacurate estimate of the position given by longitude and latitude."

Koehler: Koehler No. 18

"[Nebula] *In Hercules*."

William Herschel

John Herschel (1833): **h 1968**.

h 1968 = M13.
Sweep 71 (April 24, 1827)
RA 16h 35m 35.1s, NPD 53d 12' 57" (1830.0) [Right Ascension and North Polar Distance]
Very rich cluster; irreg figure; vL; vgmbM; stars 10....15 m, of which there must be thousands; does not come up to a nucleus; has hairy-looking curvilinear branches. (See fig. 86.)
Very rich cluster; irregular figure; very large; very gradually much brighter toward the middle; stars from 10th to 15th magnitude, of which there must be thousands; does not come up to a nucleus; has hairy-looking curvilinear branches. (See fig. 86.)

Sweep 28 (May 9, 1826)
RA 16h 35m 36.2s, NPD 53d 12' 39" (1830.0)
Irreg R with scattered stars in streaky masses and lines. Excessively condensed, to a perfect blaze. *s 11...20m; 7' or 8' diameter. Most magnificient object. The state of compression indicates a globular form not much denser at the centre.
Irregularly round with scattered stars in streaky masses and lines. Excessively condensed, to a perfect blaze. Stars from 11th to 20th magnitude; 7' or 8' diameter. Most magnificient object. The state of compression indicates a globular form not much denser at the centre.

Sweep 72 (April 27, 1827)
RA 16h 35m 39.7s, NPD 53d 12' 45" (1830.0)
A very fine and striking object, but nothing to add to the description of Sw 71.

Smyth: **DLXXXV [585]. M13**.

DLXXXV. 13 M. Herculi.
AR 16h 35m 58s, Dec N 36d 45'.8
Mean Epoch of Observation: 1836.62 [Aug 1836]
[with a drawing]

A large cluster, or rather ball of stars, on the left buttock of Hercules, between Zeta and Eta; the place of which is differentiated from Eta Herculis, from which it lies south, a little westly, and 3deg 1/2 distant. This superb object blazes up in the centre, and has numerous outliers around its attenuated disc. It was accidentally hit upon by Halley, who says, "This is but a little patch, but it shows itself to the naked eye, when the sky is serene, and the moon absent." The same paper, in describing this as the sixth and last of the nebulae known in 1716, wisely admits, "there are undoubtedly more of these which have not yet come to our knowledge:" ere half a century passed, Messier contributed his 80 or 90 in the Catalogue of 103; and before the close of that century WH [William Herschel] alone had added to the above 6, no fewer than 2500; and his son, in re-examining these, added 520 more! In my own refractor its appearance was something like the annexed diagram; but I agree with Dr. Nichol, that no *plate* can give a fitting representation of this magnificient cluster. It is indeed truely glorious, and enlarges on the eye by studying gazing. "Perhaps," adds the Doctor, "no one ever saw it for the first time through a telescope, without uttering a shout of wonder."

This brilliant cluster was discovered by Halley in 1714; and fifty years afterwards it was examined by M. Messier, with his 4-foot Newtonian, under a power of 60, and described as round, beautiful, and brilliant; but, "ferret" as he was in these matters, he adds, "Je me suis assuré qu'elle ne contient aucune étoile." This is rather startling, since the slightest optical aid enables the eye to resolve it into an extensive and magnificient mass of stars, with the most compressed part densely compacted and wedged together under unknown laws of aggregation. In 1787, Sir William Herschel pronounced it "a most beautiful cluster of stars, exceedingly compressed in the middle, and very rich." It has been recently viewed in the Earl of Rosse's new and powerful telescope, when the components were more distinctly separated, and brighter, than had been anticipated; and there were singular fringed appendages to the globular figure, branching out into the surrounding space, so as to form distinct marks among the general outliers.

John Herschel, General Catalogue: **GC 4230**.

GC 4230 = h 1968 = M13, Halley.
RA 16h 36m 41.2s, NPD 53d 16' 19.4" (1860.0) [Right Ascension and North Polar Distance]
!!; Glob. Cl.; eB; vRi; vgeCM; st 11...20. 14 observations by W. & J. Herschel.
Very remarkable; globular cluster; extremely bright; very rich; very gradually extremely compressed toward the middle; stars from 11th to 20th magnitude.
Remark: Figures in P.T. 33 [JH 1833], plate viii, fig. 86; P.T. 61 [Lord Rosse 1861], plate xxviii, fig. 33.

Huggins

[Further Observations on the Spectra of some Nebulae, with a Mode of determining the Brightness of these Bodies. *Phil. Trans. Roy. Soc.*, Vol. 156 (1866), p. 381-397; here p. 389]
[No. [GC] 4230. 1968 h. 13M. R.A. 16h 36m 41s.2. N.P.D. 53d 16' 19".4. Cluster; extremely bright.]
Spectrum of the central blaze continuous. Spectrum ends abruptly in the orange. The light of the brighter part is not uniform; probably it is crossed either by bright lines or by lines of absorption.

Dreyer: **NGC 6205**.

NGC 6205 = GC 4230 = h 1968; Halley 1714, M 13.
RA 16h 36m 40s, NPD 53d 16.3' (1860.0) [Right Ascension and North Polar Distance]
!! Glob. Cl., eB, vRi, vgeCM, st 11...; = M13
Very remarkable globular cluster, extremely bright, very rich, very gradually extremely compressed toward the middle, stars of 11th magnitude and fainter.
Remark: Figures in P.T. 33 [JH 1833], plate XVI, fig. 86; P.T. 61 [Lord Rosse 1861], plate XXVIII, fig. 33; H.C. [Winlock and Trouvelot, *Annals of Harvard College Observatory*, vol. viii], plate 25.

Curtis

[Descriptions of 762 Nebulae ans Clusters photographed with the Crossley Reflector. Publ. Lick Obs., No. 13, Part I, p. 9-42]
NGC 6205, RA=16:38.1, Dec=+36:39. [Publ. Lick Obs.] Vol. VIII, Plate 53. M. 13, the Great Cluster in *Hercules*. 10 s.n.

- Observing Reports for M13 (IAAC Netastrocatalog)

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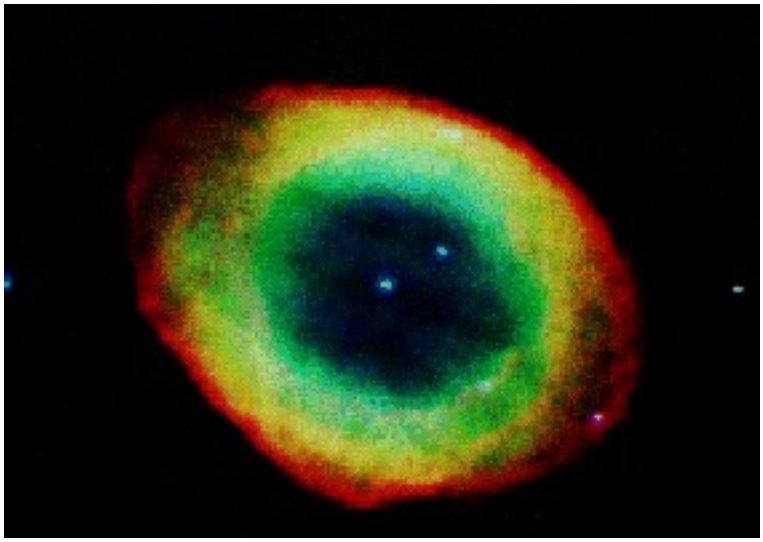
Last Modification: 8 Feb 2004

M 57

Planetary Nebula *M57 (NGC 6720)*, type 4+3, in Lyra

Ring Nebula

Right Ascension	18 : 53.6 (h:m)
Declination	+33 : 02 (deg:m)
Distance	2.3 (kly)
Visual Brightness	8.8 (mag)
Apparent Dimension	1.4x1.0 (arc min)



Discovered by Antoine Darquier de Pellepoix in 1779.

The famous ring nebula M57 is often regarded as the prototype of a planetary nebula, and a showpiece in the northern hemisphere summer sky. Recent research has confirmed that it is, most probably, actually a ring (torus) of bright light-emitting material surrounding its central star, and not a spherical (or ellipsoidal) shell, thus coinciding with an early assumption by John Herschel. Viewed from this equatorial plane, it would thus more resemble the Dumbbell Nebula M27 or the Little Dumbbell Nebula M76 than its appearance we know from here: We happen to view it from near one pole.

This is contrary to the belief expressed e.g. in Kenneth Glyn Jones' book. There are even indications from investigations of deep observations such as George Jacoby's deep photos obtained at Kitt Peak National Observatory that the overall shape might be more that of a cylinder viewed along the direction of the axis than that of a ring, i.e., we are looking down a tunnel of gas ejected by a star at the end of its nuclear-burning life. Eventually, these observations have given evidence that the equatorial ring or cylinder has lobe-shaped extensions in polar directions, similar to those found in deep images of M76, but even more resembling other planetaries like NGC 6302, see e.g. the review by Sun Kwok (2000).

The deep observations also show an extended halo of material extending off to over 3.5 arc minutes (Hynes gives 216 arc seconds, quoting Moreno & Lopez, 1987), remainders of the star's earlier stellar winds. The halo was discovered in 1935 by J.C. Duncan (Duncan, 1935).

Our color photo (taken with the 200-inch Hale telescope at Mt. Palomar) shows that the material of the Ring is exposing a decreasing ionization level with increasing distance from the 100,000 to 120,000 K hot central star. The innermost region appears dark as it emits merely UV radiation, while in the inner visible ring, greenish forbidden light of ionized oxygene and nitrogene dominates the color, and in the outer region, only the red light of hydrogene can be excited.

The central star was discovered in 1800 by the German astronomer Friedrich von Hahn (1742-1805), with a 20-foot FL reflector. This object is a planet-sized white dwarf star, which shines at about 15th magnitude. It is the remainder of a sunlike star, probably once of more mass than our sun, which has blown away its outer envelopes at the end of its Mira-like phase of evolution. Now over 100,000 K hot, it will soon start to cool down, shine as a white dwarf star for a while of several billions of years, and then eventually end as a cold Black Dwarf.

As for most planetary nebulae, the distance to the Ring Nebula M57 is not very wellknown. In case of this nebula, however, attempt was made to relate its angular expansion rate of roughly 1 arc second per century with its radial expansion velocity. These results, however, were based on wrong assumptions of the geometry of this nebula, presuming a spherical shape. Therefore, until recently, only rough estimates could be made, based on various theoretical assumptions and models. The following distance values have been given: 4,100 ly (K.M. Cudworth 1974; Mallas/Kreimer), 1,410 ly (Kenneth Glyn Jones), 2,000 to 2,500 ly (Vehrenberg), 2,000 ly (Sky Catalogue 2000.0), "more than 2,000 ly" (Murdin/Allen's *Catalogue of the Universe*), 5,000 ly (Chartand/Wimmer's Skyguide), 3,000 ly (WIYN), and 1,000 to 2,000 ly (Sun Kwok, 2000). A good value for the distance still needs to be determined (e.g., parallax by Hubble Space Telescope), but recently improved CCD technics was used at the US Naval Observatory (USNO) to determine a trigonometric parallax for the central star of M57, yielding 2,300 ly (Harris *et.al.* 1997, see also STScI/Nasa, Jan 1999).

From the expansion rate of one arc second per century given above, the age of the nebula can be roughly estimated under the assumption of constant expansion. For its extension of 60x80 arc seconds, this yields a time of expansion of about 6,000 to 8,000 years.

As most planetary nebulae, the Ring is much brighter visually at magnitude 8.8 than photographically at only 9.7 mag; a consequence of the fact that most light is emitted in very few particular spectral lines (see the discussion in our planetary nebulae page). Assuming a distance of 2,300 lightyears, this corresponds to an absolute magnitude of -0.3 visually (+0.5 photographically), or an intrinsic brightness of about 50 to 100 times that of our Sun. Even the 14.7-mag central star, of the size of a terrestrial planet, is only little fainter than our Sun with an absolute magnitude of about +5 or 6. Its apparent dimension of 1.4 arc minutes corresponds to a linear diameter of 0.9 lightyears (5.5 trillion miles or 8.8 trillion km, or 60,000 Astronomical Units), the halo extending out to a diameter of 2.4 lightyears.

The mass of the nebular matter has been estimated at about 0.2 solar masses, the density at about 10,000 ions per ccm (cm^3). Its chemical composition has been determined as follows: On each Fluor (Fl) atom, the Ring Nebula contains 4.25 million atoms of Hydrogene (H), 337,500 Helium (He), 2,500 Oxygene

(O), 1,250 Nitrogene (N), 375 Neon (Ne), 225 Sulfur (S), 30 Argon (Ar) and 9 Chlorine (Cl) atoms. It is expanding at 20 to 30 km/s, and approaching us at 21 km/s.

M57 images by Finnish astronomers have shown a star which is superimposed (before or behind) over the ring.

For amateurs, it is always a challenge to identify the faint central star of the Ring. Note Tom Polakis' photometric data of stars around M57 and the Photometry of M57 Field Stars, by Brian Skiff.

M57 was the second planetary nebula to be discovered (in January 1779), 15 years after the first one, M27. Antoine Darquier de Pellepoix (Darquier), who discovered the Ring Nebula only a few days before Charles Messier found and cataloged it, described it as "a dull nebula, but perfectly outlined; as large as Jupiter and looks like a fading planet." This comparison to a planet may have influenced William Herschel, who found the objects of this type resembling the planet newly discovered by him, Uranus, and introduced the name *"Planetary Nebulae"*. Herschel described M57 as "a perforated nebula, or ring of stars;" this was the first mention of the ring shape. Oddly, the inventor of the name "Planetary Nebula" did not count this most prominent representative in this object class, but described it as a "curiosity of the heavens", a peculiar object. Herschel also identified some of the superimposed stars, and correctly assumed that "none [of them] seems to belong to it."

M57 is very easy to locate as it is situated between Beta and Gamma Lyrae, at about one-third the distance from Beta to Gamma. It can be seen with binoculars as an almost stellar object, difficult to identify just because of its small apparent diameter. In smaller amateur telescopes, the ring becomes apparent at about 100 magnification, with a darker middle; a 12th-mag star is east of the planetary nebula, about 1' of the center. If ever color is notable, the Ring Nebula appears slightly greenish, not unexpected because most of its light is emitted in few green spectral lines. Even in small scopes, a slight ellipticity can be noted, with major axis in a position angle of about 60 deg. With increasing aperture and under good condition, more and more detail becomes visible, but even in large instruments, the central star will be apparent only under exceptionally good conditions, or with the help of filters. In large instruments, several very faint foreground or background stars can be glimpsed within the nebula's extension under very good conditions.

Of the neighboring stars, Beta Lyrae (Sheliak) is a notable eclipsing binary, with components of spectral type B7 and A8, varying between mag 3.4 and 4.4 with a period of 12.91 days. Gamma Lyrae (Sulaphat, Arabic for "Tortoise") is a giant of spectral type B9 III and mag 3.2 with a mag 12 companion at 13.8" distance in position angle 300 deg. The 0.4' small and 14.4-mag faint galaxy IC 1296 is situated just 4' NW of M57 and can be found with large instruments.

- Historical Observations and Descriptions of M57
- HST image of M57; October 1998 HST image
- KPNO images of M57

- WIYN images of M57
- Three faces of M57 by George Jacoby, KPNO (showing faint outer envelopes with increasing detector sensitivity)
- Lowell 1.1-m images of M57 (Bill Keel)
- More images of M57
- Amateur images of M57, more amateur images

Bill Arnett's Ring Nebula M57 photo page, info page.

- Multispectral Image Collection of M57, SIRTF Multiwavelength Messier Museum
- Jack Schmidling's M57 page

- SIMBAD Data of M57
- NED data of M57
- Observing Reports for M57 (IAAC Netastrocatalog)

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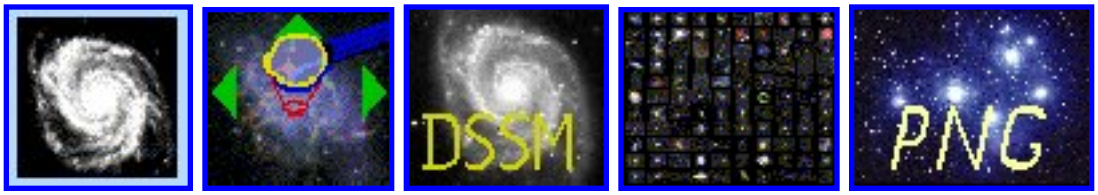

Last Modification: 15 Mar 2000, 19:30 MET