The Messier List: Conquering the Virgo-Coma Region of Galaxies

Once you become interested in amateur astronomy, you'll quickly run across Charles Messier's list of 110 deep sky objects. In fact, many names were probably already familiar--the Crab Nebula (M1), the Andromeda Galaxy (M31), the Orion Nebula (M42/43), the Ring Nebula (M57) and perhaps the Hercules Cluster (M13). Our spring skies contain many galaxies in the Virgo-Coma Berenices region with 15 of them appearing on Messier's list. How do you go about finding and identifying them in an area so small? Galaxies are hard enough to hunt by themselves but with so many, including numerous non-Messier objects, how do you avoid becoming frustrated in the search?

There certainly are many galaxies crammed in this 18º wide region between Vindemiatrix and Denebola--nearly 65 which are brighter than 13th magnitude. It can seem confounding. It sure did to Messier with his 6 inch Gregorian reflector and he did have his problems. His big mistake was incorrectly plotting M91. With all these distant smudges, he confusingly misplaced M91 by triangulating on his map from M58 instead of the correct M89. So, it's quite understandable about observer's trepidation when galaxy hunting in this area. But don't let that stop you--you have better maps and better scopes and you know that it can be done.

First Things First

1. A star map that show stars to at least the 7th magnitude will make the effort much easier. The Cambridge Star Atlas is adequate but Sky Atlas 2000 is even better.

2. At first glance, these galaxies reside in an apparently vacant stretch of the sky from Vindemiatrix (Epsilon Virginis) to Denebola (Beta Leonis). However, a closer look will reveal many 5th and 6th magnitude stars. An easy way to become familiar with this area is by carefully mapping it with a pair of low power and low aperture binoculars. Birding binoculars (about 8x30) are more suitable than common household binoculars (10x50) because they won't show an overabundance of confusing dim stars. Plot all the stars, compare them with the star map, and then add the Messier galaxies when you find them. Two areas will stand out: 4 dim stars around Rho Virginis and 4 dim stars near 6 Coma Berenicis. Rho and 6 Coma will be important guide stars.

These stars have been plotted in figure 1. Notice that the dimmers stars have not been designated by their common names, but by their magnitudes. The decimal has been left out to avoid mistaking it for a dim star.

3. Begin the search using a methodical pattern. Since the constellations drift across the sky in a westwardly direction, start with the galaxies M98, 99 and 100 because they will set first. Objects at low declinations spend less time each night in the sky than those at higher declinations. Therefore, if possible, try working from a south to north direction.

4. Know the field of view of your finderscope and eyepieces. This will aid in triangulation and sweeping away from the guide stars to the target galaxy. When looking through your instruments, always know which ways are north and west. In most finderscopes, refractors, and reflectors, the image in the eyepiece is inverted. Therefore, north is "down" and west is "left". However, in a Schmidt-Cassegrain using a star diagonal, the view is a mirror image. In these scopes, north will be "up" and west will be to the "left".

5. Using the two guide star regions shown in figures 2 and 3, triangulate with your finder scope to the suspected galaxy location. For instance, to find M98 locate 6 Coma Bernenicis. Use your lowest power eyepiece and move to the west about 1/2º. Bingo!

6. The bright galaxies M49, 60, 84, 86 and 87 can be seen directly in 8x50 finderscopes. Locate them by positioning your scope half way between Vindemiatrix and Denebola. This group of dim smudges will assist in finding the much more difficult M89 and M90. See Chart 1: Triangulation to the Galaxies.

7. Because Messier catalogued the objects that were discovered first, his galaxies are generally the brightest ones. If you have several smudges in the field, the Messier galaxy is dominant. For instance, M87 is a bright galaxy at magnitude 9.7. Scopes of at least 8 inches may reveal 12.3 magnitude NGC 4478 and 13.1 magnitude NGC 4476 that are only 8 and 13 minutes to its southwest.

The area immediately to the east of M84 and M86 contains two bright non-Messier galaxies that go by "The Eyes." NGC 4435 and 4438 are only 5 minutes apart and appear like 2 eyes staring back at you in the eyepiece of an 8 or 10 inch scope. Refer to Chart 2: Galaxy Size and Brightness.

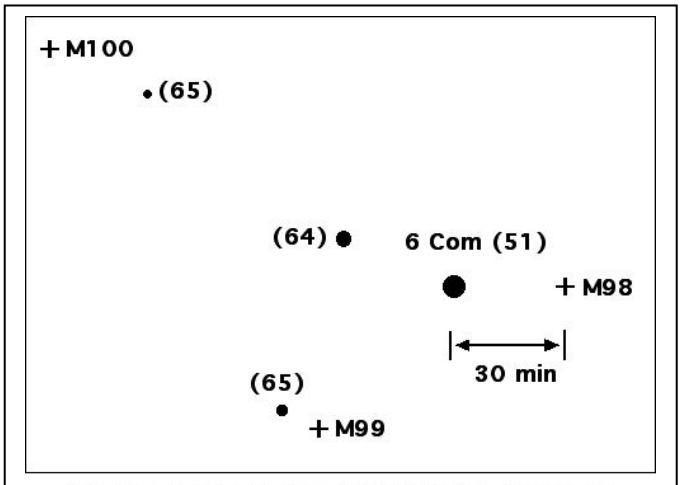

figure 2: 6 Coma Berenices Region

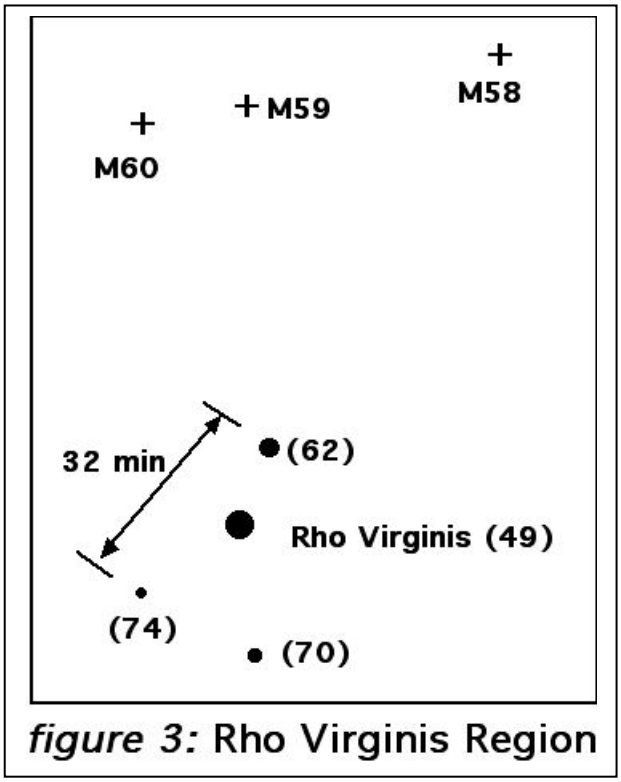

figure 3: Rho Virginis Region

The Importance of Surface Brightness and Surface Uniformity

Surface brightness plays a large role in galaxy observing. Published magnitude values are an important tool used to indicate how an object will look. However, when it is finally located, the object's brightness may appear much differently than expected. One reason is that the integrated magnitude value indicates the brightness of the extended object as if it was concentrated in a point source. A bright large object can be very difficult to see (e.g. M33 and M101). Instead, a more suitable parameter is the surface brightness because it factors in the size of the object along with its magnitude.

Another factor which influences an extended object's appearance is its uniformity of surface brightness. This value is difficult to quantify. A galaxy's core could be relatively bright with its outer reaches being very dim. Its overall surface brightness would be low, but its inner core still would be very visible. Most Messier galaxies have a bright core and that is likely what will be seen.

When You Complete the List...

What will you have gained after completing the Messier list other than a neat certificate and a cool pin? You certainly will have a more thorough knowledge of the stars and constellations, you will be able to star hop with the best of them and you will have a good idea of what your telescope can do. But maybe most importantly, you will have a great respect for Charles Messier who most likely discovered these deep sky objects with a lesser telescope than yours.

Have confidence. If pursued in a methodical manner, the galaxies in Virgo-Coma will fall one by one. Happy hunting!

Chart 1: Triangulation to the Galaxies

Galaxy	Suggested Search Method Using Finderscope
M49	1/3 between stars 60 and 64
M58	NW of Rho Virginis
M59	N of Rho
M60	N of Rho
M84	1/2 between Vindemiatrix and Denebola
M85	NE of 11 Coma
M86	1/2 between Vindemiatrix and Denebola
M87	1/2 between Vindemiatrix and Denebola
M88	SW of M91
M89	1/2 between star 61 and M87 group
M90	1/2 between star 61 and M87 group
M91	1/3 between star 57 and 6 Coma
M98	W of 6 Coma
M99	SE of 6 Coma
M100	NE of 6 Coma

Chart 2: Galaxy Size and Brightness

Galaxy	Size (min)	Magnitude	Surface Brightness (mag./min2)
M49	10.3 x 8.4	9.1	12.9
M58	5.8 x 4.7	10.6	13.1
M59	5.4 x 3.7	10.6	12.8
M60	7.4 x 6.0	9.6	12.9
M84	6.4 x 5.6	10	12.6
M85	7.0 x 5.5	10	13
M86	9.0 x 5.8	9.8	13.2
M87	8.3 x 6.6	9.6	12.9
M88	6.9 x 3.7	10.3	13
M89	5.1 x 4.7	10.5	12.9
M90	9.6 x 4.4	10.3	13.5
M91	5.4 x 4.3	11.1	13.5
M98	9.7 x 2.7	10.8	13.6
M99	5.4 x 4.8	10.1	13.2
M100	7.5 x 6.4	10.2	13.3
The Eyes:			
NGC 4438	8.6 x 3.2	10.9	13.8
NGC 4435	3.0 x 1.9	10.8	12.6
Near M87:			
NGC 4476	1.9 x 1.3	12.3	13.2
NGC 4478	2.0 x 1.8	11.2	12.6