MESSIER SURVEYS

Jay Reynolds Freeman

March is Messier marathon madness month, but the Messier catalog provides observers with many other observing projects. I have never attempted the dusk-to-dawn grind of a full marathon, but I have viewed the entire Messier catalog in a more leisurely manner more than twenty-five times, with as many different instruments, from a 7x50 binocular and a 50 mm beginner refractor to a 36 cm Schmidt-Cassegrain. There are good reasons to do so. Such Messier surveys provide interesting tests and comparisons of deep-sky capabilities of equipment, they develop my observing skills, and most of all, they are fun.

I came upon the habit of going through the whole catalog with a single instrument rather by chance. The first time, in 1978, I had no choice. My only serviceable instrument was a 7x50 binocular with simple magnesium fluoride coatings. That Messier survey was the most difficult I have ever performed, but for that reason, it was the most fun.

Many Messier objects are easy, even at such small aperture as 50 mm, but by no means all, and four were especially tough. Three globular clusters along the bottom of the Sagittarius teapot, M54, M69, and M70, were sinking into evening twilight when I sought them from a site with a light dome southwest. Their outer reaches merged into the skyglow, and at 7x, their nuclei looked a lot like stars. It took much staring to be certain I had found them. And M76, the "Little Dumbbell" nebula in Perseus, was just plain faint. I finally located it one fine night, nearly at the zenith, after several hours of dark adaptation.

Some observers consider face-on spiral galaxy M74 the most difficult Messier object, because of low surface brightness. Where the sky is bright, I might agree, yet in dark sky, it was not nearly as tough for the 7x50 as M76.

The binocular showed few details. Many open clusters were partially resolved, and a few nebulae showed hints of shape or structure, but that was about it.

Part way through that first survey, I completed a 15 cm f/5 hand-held Newtonian. It so outperformed the binocular that I was eager to review all the Messier objects I had already seen, with its greater aperture. Yet the binocular survey was fun, so I just had to finish it. So I turned a page in my logbook and started a separate listing for Messier objects seen with the 15 cm. Before long, I bought a 36 cm Schmidt-Cassegrain, which was almost as much an improvement over the 15 cm as that telescope had been over the binocular. I started a Messier

survey with the big SCT, as well. Thus my habit grew.

Nearly two decades and many Messier surveys later, I acquired a more modern 50 mm binocular, which showed Messier objects more easily than my old 7x50. It was fully multicoated, and had a higher magnification of 10x, which darkened the sky background, and thus perhaps increased the visibility of low surface-brightness objects. I even saw a hint of one curve of the brightest spiral arm in M33.

At about the same time, I became curious whether the inexpensive refractors, that are often marketed to beginners on the basis of ridiculously high magnifications, were good for anything at all. To find out, I bought a 50 mm f/12 sold by a major manufacturer. Out of the box, it was indeed not good for much, yet on the bright side, its quality was so poor that even simple modifications made vast improvements. The achromatic objective was actually pretty good -- I was fortunate to have chosen a model that had an achromat -- but it helped a lot to use coated Kellner eyepieces in place of the second-rate Huygenians that came with it. The mount was so flimsy that even duct tape made it a lot steadier. So refurbished, at 24x and 33x, the diminutive refractor showed all the Messier objects with only a little effort. M76 remained toughest, but the higher magnifications, compared to the binoculars, made it much easier to be sure it was non-stellar. I wouldn't recommend such a junky telescope for astronomy, but if you are stuck with one, do not despair, perhaps you can make it useful enough to see all the Messier objects.

Just a bit more aperture made the hunt vastly simpler. The Messier catalog was no problem in Refractor Red, my 55 mm fluorite refractor, most often using 37x, or in a 60 mm vintage beginner refractor from the 1960s, generally at 28x, again with better eyepieces than standard. Optically, these instruments were more than enough for the task, though the older telescope's tabletop tripod was inconvenient, for I did not have a table handy. I had to lie on the ground.

Another inexpensive beginner's instrument proved even more capable; namely, a contemporary commercial 76 mm f/10 Newtonian, with the 17 mm Plossl eyepiece (45x) that came with it. At that aperture and magnification, a Messier survey was straightforward. It helped that the little reflector had a decent mount, right out of the box.

Though 50 mm binoculars were the most demanding instruments for Messier work, somewhat larger ones were the easiest. I have tried a late model 10x70 and 14x70, both multi-coated, and an older 11x80, with magnesium fluoride coatings. Their increased aperture and magnification made short work of targets difficult for the 7x50. These binoculars are

light enough that with a little care, I can hand-hold them, which makes finding things quick and easy. (I have a 25x100 as well, but it is too heavy for effective use without a mount.) In the Sagittarius Milky Way and the Realm of the Galaxies in Virgo, I can identify Messier objects faster than I can count. They also begin to show features in things other than open clusters. M33 reveals spiral arms for sure, and on a very good night high on the south slopes of Mauna Kea, I was able to glimpse hints of hints of structure in M83, and in the main galaxy of M51, in my 14x70. Larger emission nebulae, such as the Orion, Lagoon, and Omega nebulae, begin to show pleasing detail, as well.

As apertures rise past 8 cm, all Messier objects become easy in dark sky. At convenient telescopic magnifications, open clusters resolve, and a few globular clusters show a granular texture or even partial resolution, perhaps most obviously in M22. With steady seeing and considerable magnification, 10 cm will resolve stars in several globulars. At that aperture and lower magnification, M51 hints of spiral structure, and a dark lane or two show up in M31. Many people find it difficult to believe that these details can be seen with such equipment. Let me point out that I myself could not see them at first; only with experience using small instruments for demanding observations did I learn how to do so.

15 or 20 cm suffices to show off Messier objects to persons not used to visual observation. Views through such telescopes will not match expectations set by coffee-table astronomy books, but newcomers will be able to see most Messier objects well enough to understand what they are. Many telescopes in this size range are highly portable and easy to use, too. No wonder they are popular with beginners.

Such apertures may allow skilled observers who are well dark-adapted to detect color, or at least color variation, in some Messier objects. Results with direct and averted vision may differ, and it might help to ask yourself, not whether the object is colored, but whether different parts of it are colored differently. M20, the Trifid nebula, is a good example. Its larger, southwest portion, divided by dark lanes into the three sectors which give it its name, is an emission nebula, while its smaller part shines by reflection. Even with just 10 cm, I sometimes sense that these two parts of the object have different colors, though I cannot tell what the colors are without more aperture. With larger telescopes, when I see color in the reflection-nebula part, it always looks pale blue, but the larger, emission part often looks greenish with direct vision, particularly near the center, but reddish with averted vision, particularly near the periphery.

The Orion Nebula, M42, shows color as well, some times, with hues

ranging from pinks through greens and warm grays. M57, the Ring Nebula, may show green. (With my big SCT I have occasionally logged its outer edge as ruddy.) And I have sometimes sensed individual bright stars in M22 as looking somewhat yellower than the general background of the cluster as a whole.

Yet aperture wins, so it is no surprise that my favorite telescope for Messier viewing is my 36 cm SCT. With such a large telescope, the only problem with Messier objects is that many are too big for the field of view. When I use it to view the Pleiades, I get lost in a far-flung wonderland of bright suns. M24, the lesser Sagittarius star cloud, is an enormous cloud of fainter ones, strewn with dark nebulae, asterisms, and small clusters. This telescope reveals spiral detail in additional galaxies, notably M74, M81, M83, M101, and M104, it shows less well-defined shapes in others, and it resolves many globular clusters. When seeing permits, some objects show fascinating fine detail. 250x will show globular clusters in M31, somewhat more reveals the celebrated jet in M87, and I once presented the central star in the Ring Nebula, M57, to a modest line of viewers, on a rare night when 650x to 1000x gave a relatively steady view.

Messier nebulae often yield rich detail as well. M17 has many names, but I prefer to call it the Swan Nebula. Textured wisps at the edges of its brighter portions sometimes make me think I am looking at ruffled feathers on the neck and back of this cosmic bird.

Not farther north flies another great bird. M16 is a nebulous cluster, whose glowing gas clouds vaguely suggest an eagle in flight. Within this Eagle Nebula lies the complex dark mass, whose spectacular photograph by the Hubble Space Telescope inspired the name, "The Pillars of Creation". This structure is dimly visible in the 36 cm in good conditions, at about 100x, perhaps with the assistance of a narrow-band nebular filter. Robert Burnham used the name "The Star Queen" in connection with M16. I have never been sure whether he had in mind stars or nebula, but the silhouette of the pillars looks to me like a slender woman standing before a throne, holding an object -- perhaps a scepter -- before her.

A common myth of deep-sky observing is that with significant light pollution, there is no point bothering with large aperture, for it cannot help. Yet my Messier-survey experiences are quite the contrary. Too much light pollution can indeed ruin any prospect of observing -- I am not likely to get far with the Messier catalog in broad daylight, for example -- but even under the glowing night sky of a major metropolitan area, some deep-sky work is possible, and large aperture does it better than small.

I once lived a few Km from a brightly-lit racetrack near San Francisco Bay. While there, I performed a Messier survey with a 32 cm Newtonian that was too big to transport -- I could use it only from my yard. When the horses ran at night, I didn't need a red flashlight to see my charts, but a little to my surprise, I found all the Messier objects. I remember my glee at spying M74 at 100x, awash in glow, but still visible. With less aperture, its image would have been smaller or lower in apparent brightness, and much harder to see.

If you hunt Messier objects under such conditions, you may find that the right magnification for those with low surface brightness is higher than the minimum that works under dark sky. I hadn't figured that out when I used the 32-cm Newtonian; I would try magnifications of 200x or perhaps even more, if I were repeating that survey today. I have also occasionally used a late model zoom eyepiece for bright-sky work, so that I can make small changes in magnification. Sometimes the range of magnifications in which an object is best seen is surprisingly narrow. Without the ability to change eyepiece focal length by small increments, I might not find the right one. A ten percent difference can matter a lot.

Yet perhaps my most fascinating Messier survey uses the least equipment. I actually haven't worked very hard on this one, because I am sure I cannot hope to finish it, but even so, I have logged about two dozen Messier objects naked-eye. Some observers have spotted more. How many can you see?