The Return of Urban Imaging

By David Nakamoto

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Well, after more than six months, I finally got a chance to do some astronomy on July the 3rd. What a drought !

Oh well . . .

Once again, I was thankful for the laptop-controlled mount which made it possible to place the telescope within a half a degree of any object. The camera allowed me to see 9th mag stars to confirm where the telescope was pointing. This greatly speeds up finding objects under urban conditions where even finders are of limited use.

All photos were taken using an Orion 10-inch f/4.5 Newtonian and an Orion G3 color CCD camera.

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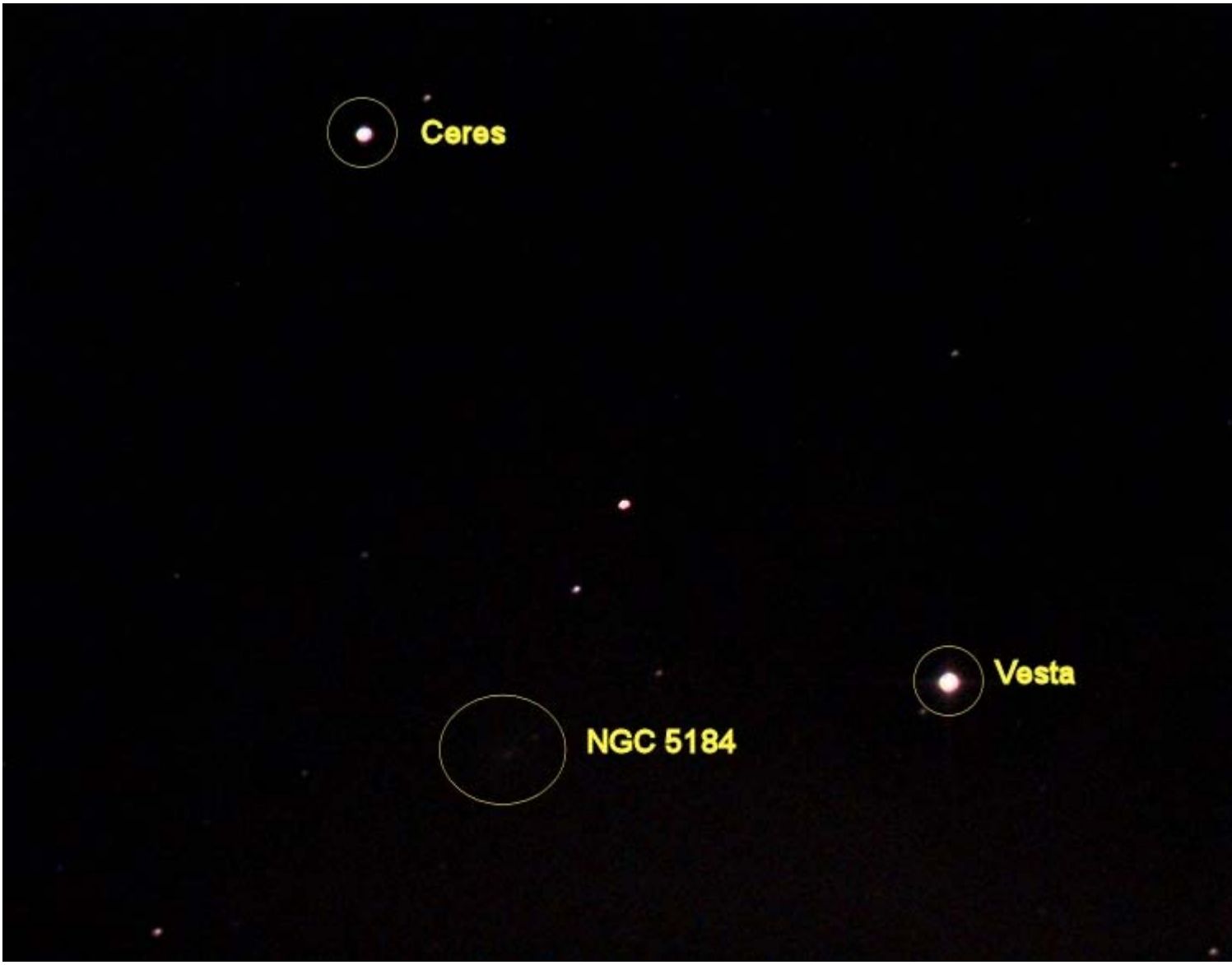
Ceres and Vesta

I rushed to photograph the close approach of asteroid Ceres to Vesta, or visa versa, before they got too low in the south-west. During the first week of July or so, Ceres and Vesta were putting on a good show with each other and a bunch of galaxies in Virgo as they approached to within a fraction of a degree of each other. While they reach opposition at the same time every 17 years or so, they're usually separated by many degrees, so for them to appear so close together is RARE. I don't believe a similar close encounter has occurred before. For a period of a week or so, the two were less than 14 arc-minutes apart, well within the field-of-view of any telescope large enough to show these two pinpoints of light. Although both asteroids appeared as stars, they're generally much brighter than any other stars in that area of the sky. Unfortunately, they're in the southern skies past the meridian as the sun sets, so the observing period is only a few hours, from the end of twilight until midnight.

In the photo below, notice the faint galaxy NGC 5184 in the same field of view. There were also a sprinkling of much fainter galaxies across the photo, but they

didn't record on the photo because this is just a 30-second exposure. North is up and east is left in all images.



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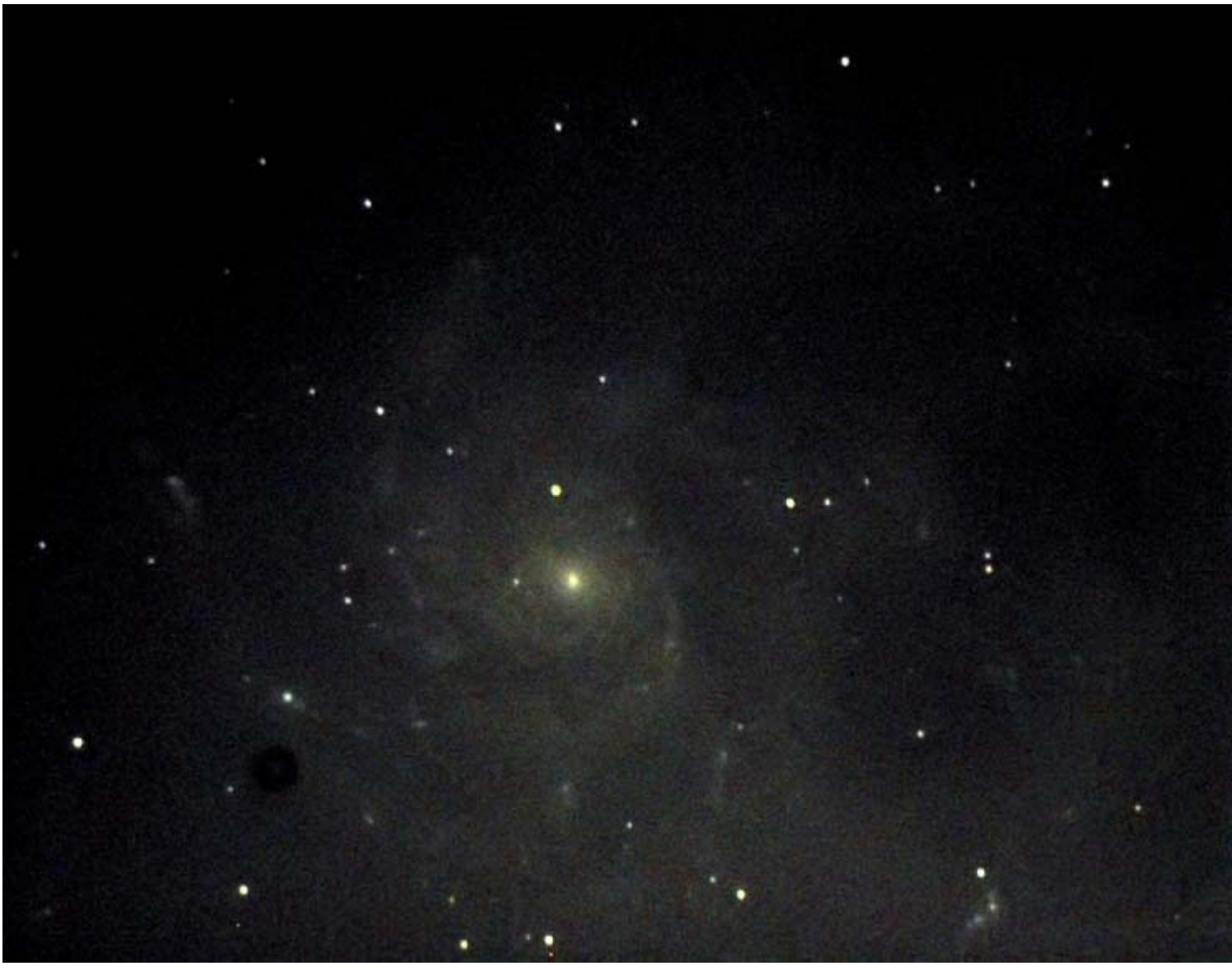
M101

M101 was my second target. This galaxy is both famous **and** infamous. The fame comes from the appearance, which gave this galaxy the nickname of "The Pinwheel" long ago, and the fact that it rises fairly high for northern observers. The infamy is harder to understand. Many a visual observer has claimed that this is an easy target, even with the unaided eye. But I've seen M31 the Andromeda

galaxy from the front lawn at Griffith Observatory with the unaided eye, once the lights were out of course, and confirmed that I wasn't deluding myself by having several other people around me confirm the sighting with their eyes. It was a thrill for them when I pointed out what they were seeing ! But M101, never.

It's also one of the most difficult objects to photograph. The reason in both cases is that it is a face-on spiral, and as a group these present the faintest brightness-to-unit-sky-area. When I turned my telescope on it, I hardly expected to see anything significant, but there, in the 1 second 2x2 binned image I use to center objects in the telescope, the core was visible as a fuzzy star, and were those hints of spiral arms. So I took a 60-second unbinned exposure and after further processing, this is what I got:



I had to use digital noise reduction, and somewhat aggressive brightness processing to bring features out. Note the bright knots in the spiral arms. Also faintly recorded is the short thick bar extending west-to-east from the nearly stellar core. The general glow in the lower part of the image is due to one of my neighbors having unshielded and bright lights in his backyard, the big hazard with urban astronomy. The dark donut in the lower left quadrant is a shadow due to a piece of small dust on the camera. I tried to manually correct the color by adjusting the color of what I took to be a white star to have equal levels of red, green, and blue.

About that glow, I thought long on this problem, and it seems to me that it might be caused by stray light hitting the inside of the telescope tube opposite from the eyepiece holder. Since my telescope is a Newtonian, I don't think it's due to stray light hitting the primary mirror all the way down the tube, but light might be "leaking in" around the secondary mirror. The camera is certainly sensitive enough at even with short exposures to pick up on this light. A similar thing happened to me with my 5-inch f/12 Orion Maksutov. I managed to tame most of that telescope's stray light glow using a dew shield. Now normally one doesn't think to use a dew shield on a Newtonian reflector, since the primary mirror is at the bottom of the tube, not the front, and so is the last thing to dew up, but in this case, if a dew shield stops ambient light from entering in and shining on the tube opposite the eyepiece holder, it might cure this problem. I've ordered a 10-inch dew shield from Amazon, and I'll let you know what happens in the next in this series of articles.

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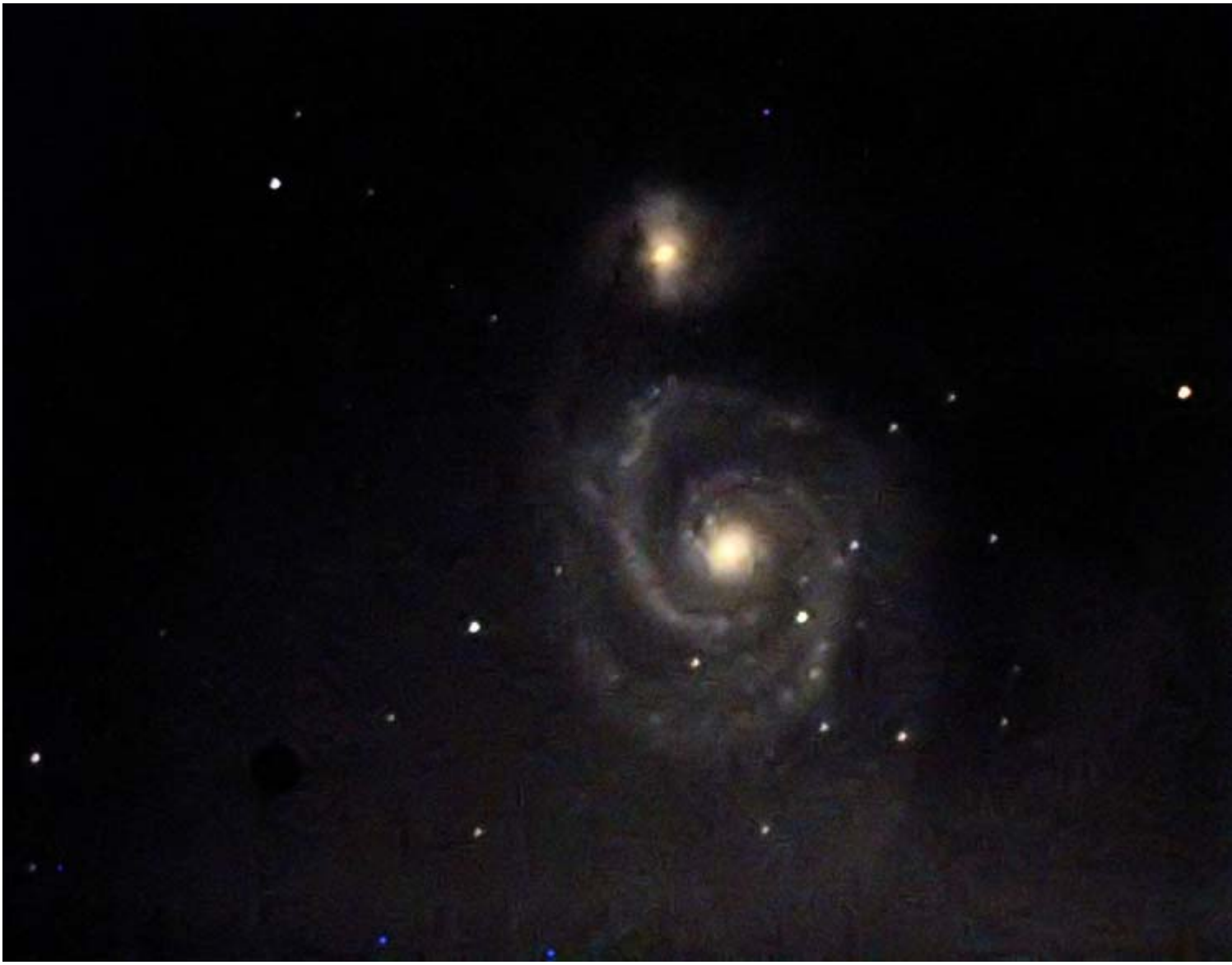
M51, the Whirlpool Galaxy

Next was the famous Whirlpool Galaxy, M51. This galaxy seems to be a favorite of astrophysics research for more than 200 years. In the 1800s it became one of the objects in the debate as to the nature of spiral nebula. Lord Rosse finally resolved it into a definite spiral structure around 1845(!!) using his 72-inch diameter, 53-foot (f/8.8) focal length reflecting telescope, nicknamed "The Leviathan of Parsonstown". He also claimed to resolve M51 into stars. I think it might be possible despite the speculum mirror which was inferior to glass mirrors with aluminum coatings, but he certainly had enough aperture to do so. In fact,

until the arrival of the 100-inch Hooker reflector at Mount Wilson in 1917, no bigger telescope was built.

It was later listed by Dr. Halton Arp as one of a group of peculiar galaxies, because photographs at the time could not resolve what was going on with these galaxies. Now, thanks to the Hubble Space Telescope and other modern equipment, most of these galaxies, if not all, have been resolved as interacting pairs or groups of galaxies, and this includes M51. It's located in the constellation of Canes Venatici, located under Ursa Major's tail. I always wonder what those dogs are doing there. Notice that the companion galaxy and the core of M51 are orange-yellowish, while the spiral arms are bluish. As fellow LAAS member Timothy Thompson pointed out during his excellent talk on galaxies at July's general meeting, this is because the companion and the core are composed of older reddish stars, while the arms contain much younger larger bluish stars. Star production has stopped millions of years ago in the yellowish regions, and only the very long-lived reddish stars are still there, slowing burning their hydrogen. They can last perhaps a trillion years, as opposed to our own Sun's 10 billion lifespan on the main sequence. The spiral arms are still producing stars, and so some of them can be the very hot, bluish stars, burning through their hydrogen in a matter of hundreds, of not just tens, of millions of years.

This photograph is another 60 second exposure, processed to remove noise and brightness enhanced.



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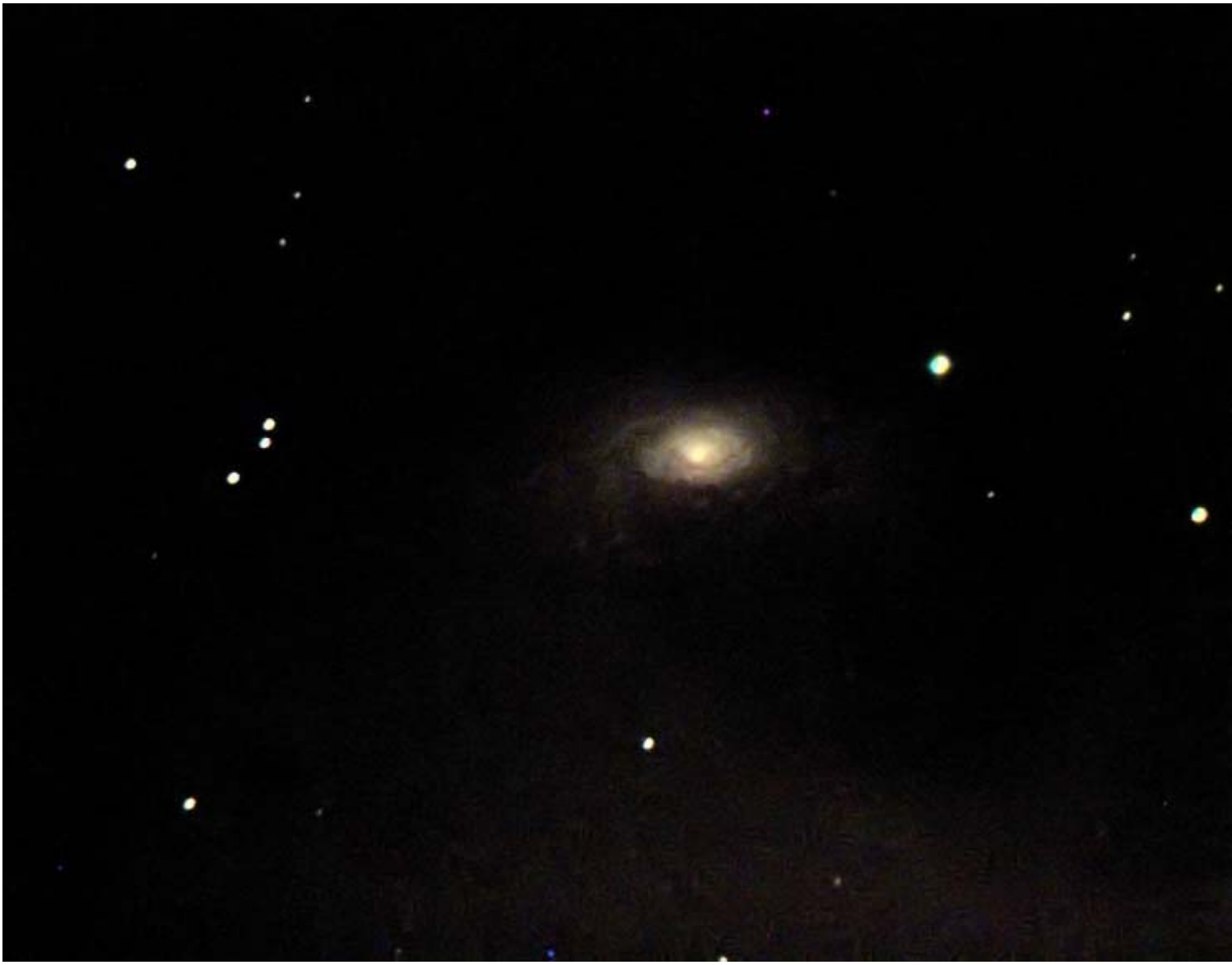
Two More Galaxies

The Sunflower Galaxy M63 also resides in Canes Venatici. It was nicknamed thus because of the fluffy nature of the still obvious spiral structure. Again, stray light produced the glow in the bottom portion of this image, another 60-second exposure.



And finally we conclude with a 60-second exposure of M102, which was a pleasant surprise, a nice edge-on with a dust lane and a large thick core. It's very similar to the Sombrero galaxy, located in the southern most regions of Virgo, but only a third the latter's size. The Sombrero's very southerly location will make it hard to image from an urban location, looking over all that urban glow, so it's nice to have a little brother located in a much less polluted position.

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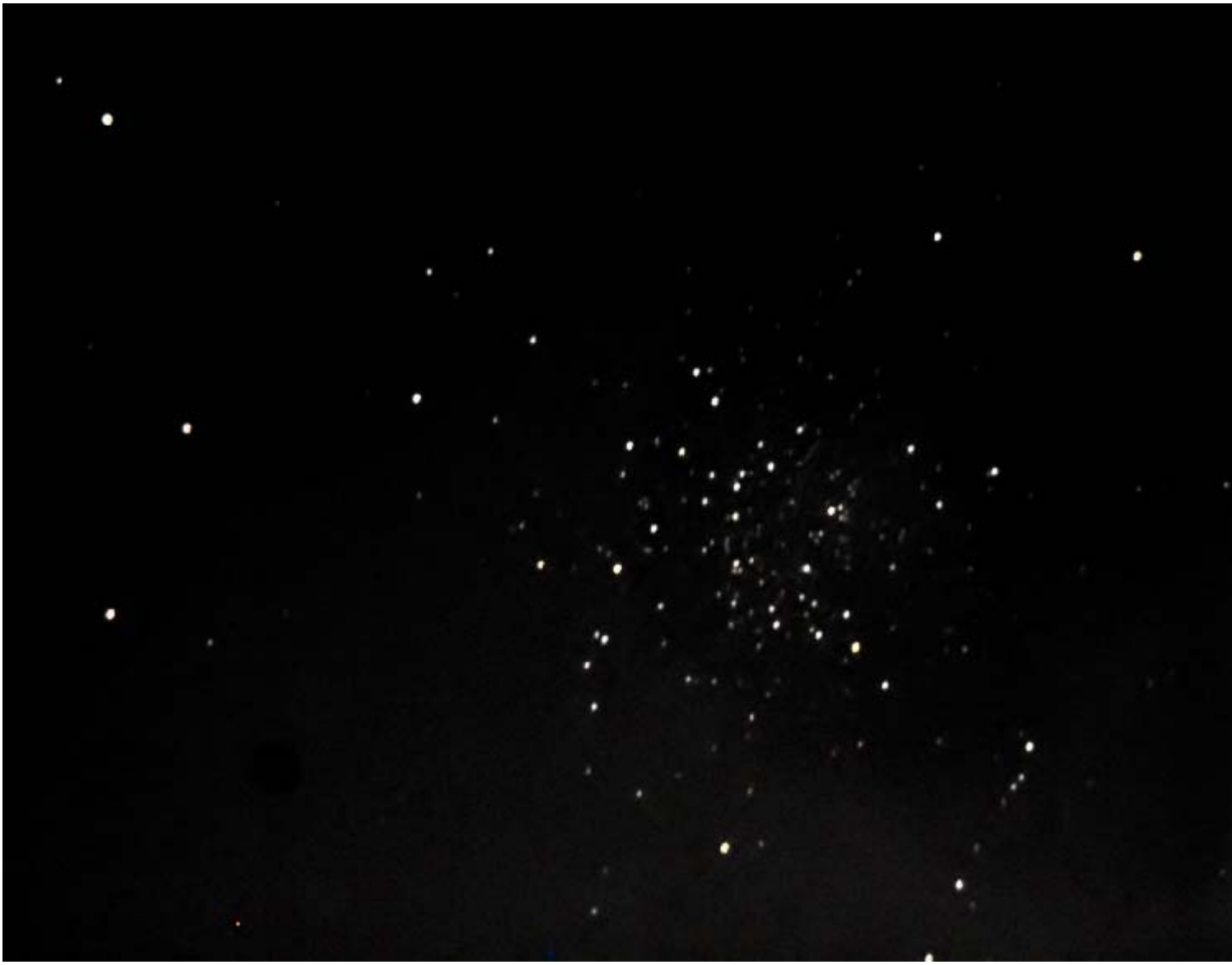
And Globulars Galore

Globulars are easy targets for urban imagers. They are usually the brightest and largest deep sky objects. The exceptions tend to be those on the Terzan, Palomar, and the other obscure catalogs, which are usually very faint and often spread out or diffuse, so even with a CCD camera they're hard to record, even under the best of conditions. However, many of the NGC globulars are easily imaged, and should be included in any urban imagers list of objects.

All these images are 30-second exposures.

Below is M3, a large globular cluster located in the extreme southern part of Canes Venatici, the hunting dogs. Fairly representative of the group, it nevertheless has its individual idiosyncratic features when compared to others such as M53, M92, and M13, all in the same general area of the sky. Today's cameras are good at bringing out the colors, which can be hard to see visually since the eye needs a lot more light before its color sensitive cones are activated. Unfortunately for my urban location, most globulars are found huddled around the middle of the Milky Way, in Ophiuchus and Sagittarius, too far south for my location.

In contrast, below is NGC-5466 in Bootes. This one shows that not all globulars are the same. In fact, it's hard to see this as a globular cluster. It looks more like a dense open cluster. Several of the fainter globulars share this sparseness.



M53 is located in the southern end of Coma Berenices. Along with NGC-4153, these are the only globulars in Coma. NGC-4153 didn't come out too well, so it was skipped. Note the urban induced glow at the bottom.

NGC-6229 is the smallest and faintest of the three globulars I know of in Hercules, and while imaged the image didn't come out. M92 below is the second largest and brightest globular, and would be better known and more often viewed if it weren't for its big brother M13.

Around 12:45 PM the evening was concluded with M13. Although a fine globular, some think M5 is better, and M22 better still. I hope to photograph both from Griffith during the August 30th public star party.

Happy observing everyone !