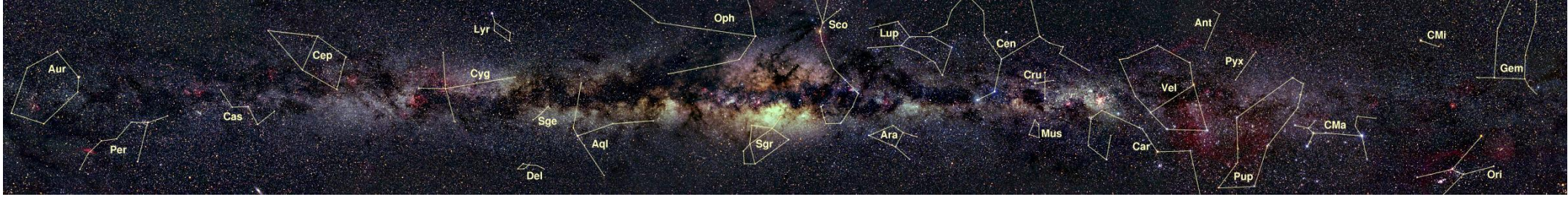
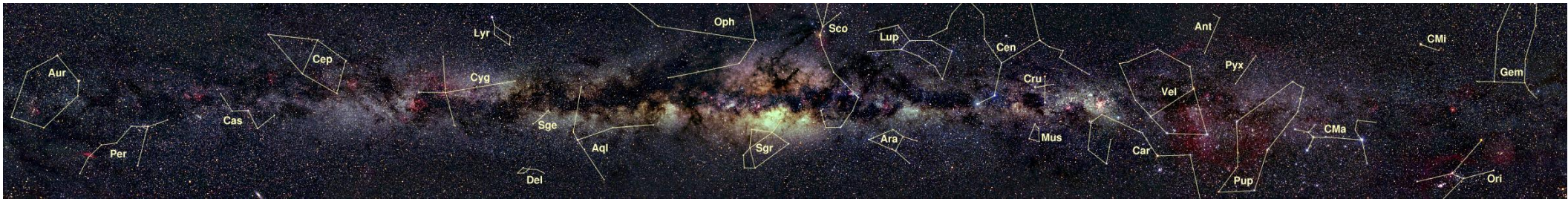


250+ Deep-Sky Objects Visible with 7x35 Binoculars and the Naked-Eye

Scott N. Harrington

2nd edition, 1st revision June, 2020
2nd edition September, 2018
1st edition June, 2017



To my family,
Who were always understanding of my excursions under the stars.

To the late Jack Horkheimer, a.k.a. Star Gazer,
Whose television show kept this young astronomer inspired during those crucial first years. I'll never stop "looking up".

And in memory of my dog Nell, who kept me company many long evenings – especially the one just before she passed away peacefully at the age of fifteen. I owe her a thanks for helping me with my observations by making this young astronomer feel safe at night. You will always be my favorite of our dogs.

Acknowledgements

Below is a list of books that I read (most for the first time) in the last few years. They were all deeply influential in helping me discover many of the toughest objects that fill out my list.

Atlas of the Messier Objects by Ronald Stoyan
*The Backyard Astronomer's Guide** by Terence Dickinson and Alan Dyer
Bright & Dark Nebulae: An Observers Guide to Understanding the Clouds of the Milky Way Galaxy by Richard P. Wilds
Cosmic Challenge – The Ultimate Observing List for Amateurs by Philip S. Harrington
Deep-Sky Companions: The Caldwell Objects by Stephen James O'Meara
Deep-Sky Companions: Hidden Treasures by Stephen James O'Meara
Deep-Sky Companions: The Messier Objects by Stephen James O'Meara
Deep-Sky Companions: The Secret Deep by Stephen James O'Meara
Deep-Sky Wonders by Sue French
Observing Handbook and Catalogue of Deep-Sky Objects by Christian B. Luginbuhl and Brian A. Skiff
Touring the Universe through Binoculars by Philip S. Harrington
Star-Hopping for Backyard Astronomers by Alan M. MacRobert
A Visual Study of Deep-Sky Objects by Roger N. Clark

*Especially the 3rd edition, which includes Glenn LeDrew's wonderfully unique Milky Way Atlas.

"Explore the Night with Bob King", an ongoing series of articles at Skyandtelescope.com, has also been an inspirational source. It is especially helpful for staying up-to-date on sudden and unexpected celestial happenings.

The map I used to hunt down nearly every object was Michael Vlasov's "**Deep Sky Hunter" Star Atlas** (2nd release), which is a free printable PDF available for download at www.deepskywatch.com, along with many other helpful PDF compendiums.

I would like to thank the many people on Cloudynights.com and the Yahoo web group Amastro who read my first edition and provided feedback and grammatical corrections. I also want to thank Andrew Usher (k_over_hbarc@yahoo.com) for all his help in editing this revision.

And I owe a big thanks to Mark Wagner and Steve Gottlieb for kindly hosting my book for free download on their website Adventures in Deep Space. For an Excel file of all the deep-sky objects I list (which Mark and Steve are also kindly hosting), please click here.

For the most spectacular and mind-blowing image that I've *ever* seen of our home galaxy, click here to see Nick Risinger's photograph.

Cover Photo: Serge Brunier/NASA
Milky Way Panorama: Axel Mellinger

Preface

As for now, I am living under natural skies. I feel like an explorer who has been given an opportunity to study the last great tract of rainforest. I spend my time documenting everything I see, because I know that there will come a day when everything I see will no longer be regarded as reality but as a myth. I hope that day never comes, but until it does, I'll be out there seeing what I can see.

That beautiful passage comes from *Hidden Treasures*, the third book in Stephen James O'Meara's *Deep-Sky Companions* series. When I came across it, I was already well on my way to completing the observations for my list. The reason I found it to be so profound a statement was because he expressed the *exact* feeling I had just recently started to develop. That was because I was just then starting to truly appreciate how dark and enviable my skies actually are.

After you read through my list, you may think that I've achieved a lot (especially for having only been an amateur astronomer for ten years). But to be honest, most of my progress came at a fairly measured pace. It wasn't until just a few years ago when I started "exhausting" the brighter objects and getting my hands on most of the books listed in the acknowledgment section that my list really became impressive. Before then, most of my observations were good, but not uncommon for a person under dark skies. I'm sorry to say now that I didn't actually think my skies were any better than average when I first started!

I must point out that as every observer is different, so is a myriad of other things, such as their observing conditions. I've found that it takes a truly never give up attitude before you can really reach your utmost limits. The reason for this is because it doesn't just take those rarest of nights – it takes a culmination of those rarest of nights *and you being out there to make use of them!* So expect to lose a lot of sleep if you ever want to be proficient in this hobby.

I have now come to realize that when it comes to using the naked-eye or binoculars, the only major difference between Stephen James O'Meara and myself is that he lived under darker skies when making the observations for his first four *Deep-Sky Companions* books. The reason I can say this is because like he did, I *live* under these skies. Which means that I can take the leisure to not just look at an object with my telescope, but also to push the limits of my 7x35 binoculars or unaided eyes to try and glimpse it. It has also allowed me as much time as I want to ferret out *every* object that might be visible from my location.

Of course, only when I knew *exactly* where to look could I spot many of the faint objects – a distinct advantage the original discoverers never had. But not detail, mind you, that's better left for larger instruments. I found that O'Meara said it best in his book *Deep-Sky Companions: The Messier Objects* when he wrote, "Of course, no photograph can record emotion. When I finally pick out a faint blur in the sky and realize that it is a galaxy 40 million light-years away, well, the visual image might not be all that impressive, but I am in awe of it nevertheless."

It is my ardent hope and ultimate mission for publishing my list for free that more people see the brightest deep-sky objects in a different light and get acquainted with some of the lesser known ones. I made the rankings just for that reason – to inform anyone, using really *any* instrument, that these are the brightest objects of their class that I could see from my location. And though a whole lot of my findings blew me away, you would be gravely mistaken if you believe that my list constitutes all the deep-sky objects visible with the naked-eye and 7x35 binoculars. That's because any observer further south will find there are many more things to see. Plus, any observer, at a darker site anywhere, will best my list if they try hard enough.

So venture forth into the night knowing there is always another gem of the sky to discover.

Before I let you delve into my list, I would like to apologize beforehand for any mistakes you might find. I would also like to remind you that I was born and raised in North America and am a resident of the Northern Hemisphere. Thus, any references to the seasons are for such.

Your Fellow Night Sky Enthusiast,
Scott N. Harrington; Evening Shade, Arkansas (August, 2018)

The author pictured with his 8x56 binoculars; Photo by Kyle Harrington

Prologue

As my title suggests, I've compiled a list of over (actually well over, as of the second edition) two hundred and fifty deep-sky objects that I've found visible from my home with only my naked eyes and a pair of 7x35 binoculars. Amazingly, the number of objects I've seen naked-eye alone total over a hundred! I've broken the objects into five distinct categories: Galaxies, Bright Nebulae, Dark Nebulae, Globular Star Clusters, and Open Star Clusters. If you manage to see all the objects I have listed, you will have in turn seen 101 objects from the Messier Catalogue, 47 from the Caldwell Catalogue*, 60 objects from Stephen James O'Meara's *Hidden Treasures* Catalogue*, and 28 objects from O'Meara's *Secret Deep* Catalogue* (including a *Hidden Treasure* and a *Secret Deep* object in Appendix A). Plus, for those interested in completing the Herschel 400 Catalogue, I can also tell you that my list contains 99 objects from it.

Each table lists the objects by their descending order of brightness as based on my unique 0 to 10 "rating of visibility" scale. I have broken the objects in each table into two parts: those that are naked-eye visible and those that are 7x35 binocular visible. The naked-eye section comes first with the objects based on their own 0 to 10 scale while the 7x35 binocular section follows with the objects based on their own 0 to 10 scale. That way if an object is just beyond naked-eye visible, it immediately falls into the first (brightest) part of the binocular section, and vice versa.

Included after the five categories of classic deep-sky objects are three appendices with objects that I have either observed, or plan to observe, with the naked-eye and 7x35 binoculars. Appendix A constitutes a mix of forty notable stars while Appendix B lists twenty-five double stars and Appendix C lists the twenty-five brightest asteroids.

I'd like to point out that every stargazing book I've ever read that was written for use with binoculars or a very small telescope always inherently contained more open clusters for the observer to seek out than any other type of deep-sky object. I decided early on however to not follow this trend by instead focusing more on the "harder" and "rarer" deep-sky objects for small apertures. That's why I intentionally took the time to seek out and rate only the open clusters that I could see with my naked eyes. And it worked because by doing so, I freed up a lot more time and energy to hunt down and see many, many more galaxies, bright nebulae, dark nebulae, and globular clusters than I *ever* thought possible. That's why you'll find those lists to be the most extensive.

Alas, I did finish with the regret that I didn't get around to giving all the globular clusters that I've seen with 7x35 binoculars a "rating of visibility". Instead, the ones that are unrated I have simply listed by their descending order of brightness (as found in Harris's paper). I'd like to rate them sometime, but until then, don't be fooled *at all* into thinking that they'll appear in the exact order that they are listed (like NGC 3201 for example, which I've found is a "10" partly because it never gets higher than 7.5° for me). You'll find the full answer to why that is in Chapter 2, titled "My Rating System".

One thing that you'll find absent from my list that really every other one has is the *coordinates* to each object. When dealing with faint objects in a telescope, they can be quite helpful in the search for them. But if you ever want to find objects with proficiency in just binoculars or a small telescope, you're going to have to learn to star-hop. That's one of the biggest reasons I'm so good at using binoculars. Besides, except for the dark nebulae, my list is only composed of the *brightest* deep-sky objects! But since some like the coordinates for various reasons (I myself use them extensively for finding dark

*These are actually just unique lists of deep-sky objects compiled by their authors and *not* catalogues in an astronomical sense since astronomical catalogues are usually the result of an astronomical survey (of some kind).

nebulae – but that's only since there aren't many maps available for them!), here is the link to all the deep-sky objects listed in Excel spreadsheet form.

One question you may have already asked yourself is why did I use such a small size of binoculars when most amateurs observe with 50 millimeters or larger? Well, for one reason, it was the only good pair to choose from on my family's shelf when I first started years ago. Another reason, that I've since come to believe, is that most observers take notice of an object if it's been quoted as being visible in only 7x35 binoculars (I certainly do!). Frankly, I'm really just glad I *didn't* start using a pair of 7x50 binoculars because I just know the number of galaxies I could've seen in them alone would've been over a hundred. In fact, I even harbor the suspicion that if I'd just used a brand new pair of 7x35s I might have reached a hundred galaxies…which of course would've only wore me out even more!

After finishing my list, I noticed that the five constellations with the brightest galaxies within their borders are exactly the ones you'd think: Virgo, 20; Coma Berenices, 12; Canes Venatici, 10; Leo, 9; and Ursa Major, 6. Just those five alone comprise two thirds of all the galaxies on my list. I also noticed that the three constellations with the brightest globular clusters within their borders are pretty much what you would expect also: Ophiuchus, 14; Sagittarius, 12; and Scorpius, 4. And just those three alone contain half of all the globular clusters on my list. Wow.

Chapter 1 – How to Use My List

All the objects have one prominent designation from a catalogue (mainly the NGC or IC – and in bold if not also a Messier object) while some even have two. The second designations that I list (except for the dark nebulae) are either from Charles Messier's Catalogue (with a bold "M"), Patrick Caldwell-Moore's Catalogue (with a "C"), or from Stephen James O'Meara's *Hidden Treasures* (with an "HT") or *Secret Deep* Catalogue (with an "SD") in his *Deep-Sky Companions* series. Why list whether the object is from O'Meara's books, you wonder? Well, first of all, O'Meara wrote a spectacular essay about each Messier and Caldwell object in his first two aptly titled *Deep-Sky Companions* books – which I encourage every small telescope user to read. Secondly, he did the same thing for each object that I have designated with an "HT" or "SD". So by noting each object that he has written about, I'm informing you of one of the best all around sources if you want to know more than what my simple naked-eye or binocular descriptions give.

For the galaxies, I list their Hubble morphological classification (as later improved by Sandage and de Vaucouleurs) from Cragin and Bonanno's *Uranometria 2000.0 Deep Sky Field Guide* (2nd edition, 2001). They were all kindly provided to me by Cliff Mygatt, a National Observing Program Director for the Astronomical League. For the bright nebulae, I list which of four types (emission, reflection, planetary, or supernova remnant) they are. The dark nebulae have their rating in the Lynds opacity scale while the globular clusters have their Shapley-Sawyer Concentration Class listed. I came up with a personal rating for the open clusters that comprises four sizes as viewed with the naked-eye.

For every object, I list the Latin name of the constellation they reside in and occasionally a second one which lies very near. Immediately following that, in bold italics, you may find a popular nickname(s) that I liked or had heard of and thought seemed fitting.

My unique rating system starts at "0" for the very brightest objects and goes all the way – sometimes in half steps – to "10". You're welcome to compare the ratings of objects from different categories, but be warned that they may not always appear to match up perfectly in your eyes since it *is* a very personal rating system. I'll go into further detail about my ratings in the next chapter.

The distances that I tried to include for every object were gleaned from professional sources (which are listed in the footnotes for each table of objects). However, they are not to be relied on too heavily because there is always some inaccuracy in the methods that professional astronomers use to derive them. The worst of the worst are the nebulae, which have uncertainties in their distances ranging from a few hundred light-years to a few thousand light-years.

My source for the magnitudes of all the deep-sky objects (except the globular clusters or unless otherwise noted) was Cragin and Bonanno's *Uranometria 2000.0 Deep Sky Field Guide* (2nd edition, 2001). A "--" means that either no magnitude was listed or that the object itself was simply not listed. They also were all kindly provided to me by Cliff Mygatt. Their only purpose is to give a sense of perspective as to what most amateur astronomers (including myself) use while considering viewing an object. However, one of the hardest lessons I learned early on was to not wholly trust the exact listed magnitude of an object. That's the biggest reason for why I started trying to rate each object as to how bright it actually appeared to my eyes.

In the Bright Nebulae and Open Star Clusters tables you will find a few objects that are listed in red. Though they do not truly belong to the category they appear in, I nonetheless encourage anyone to have a look at them. They constitute an interesting scattering of objects off the beaten path. I even like to think of some of them as being akin to objects 40 and 73 in Messier's Catalogue.

Chapter 2 – My Rating System

Since the heart and soul of my observing list is my unique "rating of visibility", which I have painstakingly given to most of the objects, I would like to take the time to go into further detail about it. The first iteration of it was a simple 1 through 5 difficulty scale that eventually evolved into what you see now as the number of objects I saw grew. The reason I like to use the term "rating of visibility" is because for some objects (like the planetary nebula NGC 2440 or the galaxy NGC 5195), its location close to a brighter star or even another deep-sky object can make it harder to glimpse. My rating tries to take that into account since I am only viewing them with little to no magnification. My rating method also better correlates between the visibility of large, extended nebulae and stellar-looking planetary nebulae.

That being said, why should you bother trying to view objects based off my rating system if your skies are quite dissimilar to mine? Well, I'm aware that observers at different latitudes or under skies with more light-pollution than mine will find the ratings not as useful. But I believe that knowledge is power. So even if the ratings turn out to be of only limited help, you'll at least have the *knowledge* of which deep-sky objects are the brightest visible under great skies from a latitude of 36.1° N.

However, because I simply "eyeballed" the rating for each object, I'm aware that it's inevitably a very personal list that will not be exactly replicable for everyone since some objects – especially the dark nebulae – can actually *only* be glimpsed under really dark skies. I must also point out that even though I observe from a near mid-northern latitude, I have tried my hardest to "reach" for objects as far south as I could. Doing this however tends to lead to ratings for very southern objects that can only be seen as such on a few exceptional nights each year. The reason for this is simply because the further an object is viewed from the zenith, the more air (and thus moisture, which scatters light) you have to look through.

The open cluster NGC 6124 in Scorpius (with a maximum altitude of 13°) is a great example of this because on most summer nights (which are notorious for having poor transparency), I find it to be difficult or not visible at all in my binoculars. That frustrated me for a long time because it has a listed magnitude of +5.8 – so it should even be visible with the *naked-eye!* I have also found that the third-magnitude star Alpha (α) Arae, which only gets 4.25° up, would be barely visible in binoculars. Then, on one cold April morning with the temperature in the low 40's (°F), I got out and found that suddenly I could see NGC 6124 with my naked eyes! I was even able to see Alpha (α) Arae without the binoculars. The difference was the amount of haze along the horizon in a spring morning compared to that of a midsummer evening. So sure, it felt strange to be shivering while looking at the "summer constellations", but I was finally able to see them at their best. Consequently, that's also when I first found I could just make out the planetary nebula M27 with my naked eyes! So I expect

Observing Tip:
I've learned there are two ways to claim seeing a dark nebula. The easiest and arguably most enjoyable one is by seeing them silhouetted against a bright background. I'm happy to say that I was able to see almost every one that I list by that first method. The second method isn't as visually rewarding, but it's sometimes the only way to see the hardest ones. That's when they can only be detected, to quote Canadian amateur astronomer Alan Whitman*, *"by the paucity of faint stars in comparison with the rest of the field or surrounding fields"*. That's right, a *lack* of stars visible is the only way to see some…but they're legitimate sightings because you're seeing the dust cloud *absorbing* the light of stars behind it.

*From his article "Dark Clouds in Taurus" in the January 2018 *Sky & Telescope*

my more southerly observations should be helpful for people observing further south than myself while sadly being only that much more frustrating for people observing further north.

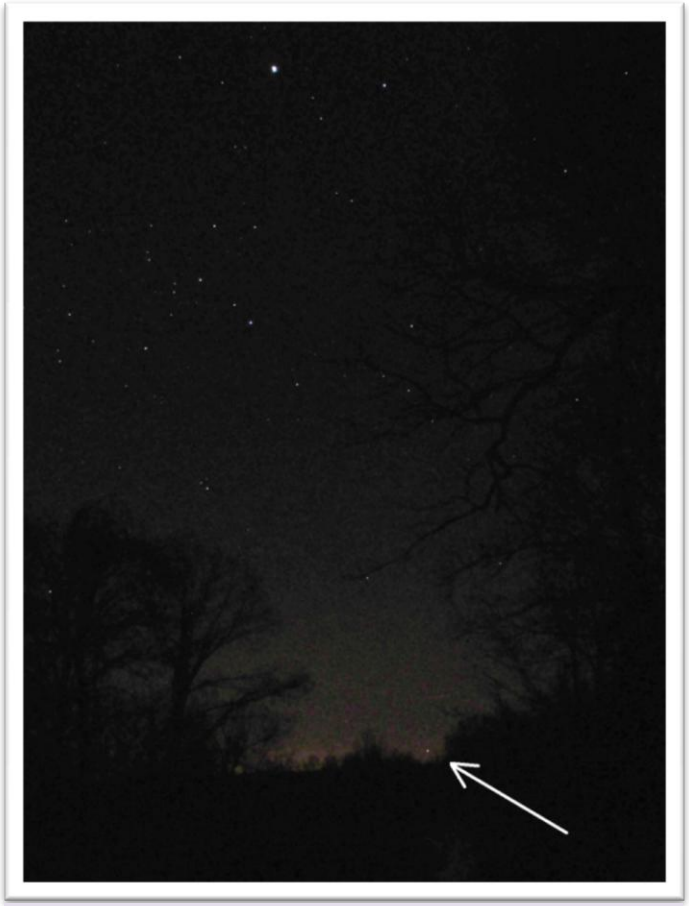
Chapter 3 – My Observing Site and Instruments

I'm lucky. Every single observation was made on my farm at an altitude of only 650 feet (195 meters) above sea level. In addition, they were all done within 100 yards of my house – with most quite literally just outside of my back door. So though I have never had to travel to do observing, that doesn't mean I don't have to contend with light-pollution. On the contrary, I actually have four light-pollution domes: small ones in the west, north-northeast, and east, along with a more moderate sized one in the south-southeast.

The biggest reason for why I believe they don't affect me as much as they probably should is because of trees. That's because from where I normally set up my telescope, even my best horizon (or tree-line, as I have to call it) is blocked by at least a degree or two of treetops. But coincidentally, each of the aforementioned light-pollution domes is also blocked, and quite well too, by the closer parts of the woods that inhabit my property. I've found this aids my night vision greatly since what would normally be the brightest parts of my sky are actually the darkest. Just another reason why I love my trees!

Every deep-sky observer is aware of their best horizon. If they're in the northern hemisphere, hopefully it's to their south. That's because you can never access that part of the sky like you normally would just by waiting for it to get higher. Sadly, objects in the far south quickly rise and then set just as fast before ever getting out of the haze along the horizon. So any obstructions there can permanently block a precious part of the deep-sky.

I myself used to be tantalized by the fact that though the second brightest star in the night sky, Canopus, can get 1.6° above my southern horizon, I wasn't able to see it! That's because as I just mentioned, from where I usually set up my telescope, anywhere from a degree to ten degrees of my southern horizon is blocked by trees. Then one evening in early 2013 I finally got to see it. I did it by walking a quarter-mile east of my house, to a clearing at the edge of my property, where there's a narrow corridor of the sky visible that runs all the way to the southern horizon.



Canopus's Brief Visit to My Skies

That first time I got to see it will always be my favorite because the sky right along the horizon was so clear that Canopus hardly seemed to be dimmed at all! It stood just above the black horizon of distant treetops twinkling a bright orange like a visitor from a distant land. As I stared at it, far below the bright stars of Orion, I had this incredible longing to see more of what lay below the horizon.

Like most amateur astronomers though, I'm more than just a deep-sky observer, so having a good eastern and western horizon is also important to me. One of the many things that I like to use them for is to see which seasonally juxtaposed constellations can be visible in the same sky. I've found that I can see the "Teapot" of Sagittarius in the southwest at the same time as the Hyades in the east. The most amazing one that I've discovered is that it's possible to see the two brightest red

giants in the same sky! Of course, I'm talking about Antares and Betelgeuse. It's only possible to catch these two "together" though in the spring, just after Antares has risen and right before Betelgeuse has set. Check it out for yourself sometime if you have a good enough west and southeast horizon.

The latitude at which I live is 36.1° north. This means that only 10% of the entire sky stays permanently below my southern horizon. However, due to light-pollution and horizon haze, the lowest object visible with the naked-eye on my list is the globular cluster NGC 5139 (Caldwell 80, Omega Centauri) while the lowest binocular object on my list is the globular cluster NGC 3201 (Caldwell 79). They only get 6.5° and 7.5° above my southern horizon, respectively. But I must again remind you, I only made the final ratings you see on the absolute *best of nights* when each object was *at or near culmination*.

I have to wear glasses to correct for my nearsightedness, so every time I mention using my naked eyes, I'm actually wearing glasses. With them, the faintest stars I have been able to see at the zenith are around magnitude +7.5. I know this for sure because I've been able to glimpse Lalande 21185, the brightest red dwarf in the Northern Celestial Hemisphere, naked-eye at magnitude +7.46. That means that I'm able to see stars nearly six times fainter than the planet Uranus! From experience though, I've found the faintest deep-sky objects that I can see naked-eye are about half a magnitude brighter. With my glasses correcting for my slight astigmatism, I can split the 209.5" arc-second wide double star Epsilon (ε) Lyrae – though I know of people who've done better. I have tried but so far failed in seeing a moon of Jupiter with just my naked eyes.

I sincerely regret not being able to give any SQM-L readings of my sky (due to the simple fact that I do not own a meter). All I can do instead is report that my best ZLM is around +7.5 in winter and mention that I have been able to easily detect my own shadow being cast by the light of Venus. Plus, I can discern the large glow of the Gegenschein on most clear nights in autumn and on the best of them can even see the zodiacal band connecting the Gegenschein to the zodiacal light. I will add that my sky is so dark that the zodiacal light is truly an overly large and bright nuisance to me when at its most prominent in the spring and autumn. Hopefully that gives you enough of an idea how dark my skies are since I'm uncomfortable trying to say exactly what they rate on the Bortle Dark-Sky Scale.

The binoculars I used were an old pair of 7x35 Bushnell Falcons (coated optics, Porro prisms) with a 7° field-of-view that I found on our shelf at home. Amazingly, the faintest stars I could see in them were around magnitude +10.1 at the zenith. The double star Psi^1 (ψ^1) Piscium, with a separation of 29 seconds of arc between its magnitude +5.3 primary and +5.5 secondary, was the closest pair I have found I could split. I do want to make sure to note that I never used or needed any form of a tripod in conjunction with my binoculars. To best view the objects, I reclined on a chaise longue, which I found to be a perfect substitute for the stability of a tripod. Also, unless otherwise noted, I tried never to block a close star nearby or surrounding stars when I gave the rating for an object. Instead, I tried to keep all my observations as natural and replicable as possible (that's also why I never used nebula filters to make my ratings).

Binocular Tip:
The most common thing that cuts short an observing session for me is the fogging up of my binoculars – be it at the eyepiece or aperture end. To combat it, I've found you need to keep your binoculars warm – particularly the eyepieces, since heat from your face can quickly fog them up if they're cold. So if I'm not going to use my binoculars for a few minutes, I like to tuck them under my jacket, which at least keeps them from getting any colder. The aperture end of binoculars is most prone to fogging from your warm breath condensing on them (especially when looking overhead). To avoid that, I try to exhale with a little more force instead of breathing softly like I normally do.

There is one handicap that I had while using my binoculars. Instead of looking through both eyes like you're supposed to, I only used *one eye and looked through the right side of my binoculars* (sorry Philip Harrington). To put it briefly, about six years ago my 7x35 binoculars came out of alignment mysteriously while out observing. I chose to continue using them like this because...well, because I kept finding new objects visible in them as I became a better observer. And as my list continued to grow and I saw exceedingly more and more difficult objects, I decided to complete it like this and use that as a handicap to hopefully entice other observers to take it on. Just that one experience – using imperfect binoculars – taught me the valuable lesson that the equipment you use isn't nearly as important as your *attitude* and *amount of motivation*.

I have since learned of the idea of "binocular summation" from Philip Harrington's (no relation) book *Cosmic Challenge*. It's the idea that the view through binoculars, since you're using two eyes, is *actually* equivalent to using one eye through a slightly larger aperture (at the same magnification). For me, a view through my 7x35 binoculars using both eyes would probably be equivalent to a one eyed view through a pair of 7x38 binoculars. That means that at the most I'm missing out on a 20% increase in light gathering – which works out to be only about 0.2 magnitudes. So although I didn't get to make use of that for my observations, I fully agree that using two eyes instead of one is easier and gives you an edge.

Galaxies†

For a binocular observer, viewing galaxies is the hardest thing to get your mind around. That's because even though most aren't easily visible, you're told that's only because their massive structures lie at unimaginable distances. So if you can successfully remember that one important fact each time you see their tiny smudges in binoculars, then like me, you'll truly enjoy seeing them that way!

Designations[1]		Type[2]	Constellation/Nickname[3]	Rtg[4]	Distance[5]	Mag[6]	Comments and Visual Notes**
NGC 224	**M31**	Spiral	Andromeda ***Great Andromeda***	**3**	2,557,000	3.1	**L-E,** The author can see the magnitude +6.9 star off its SW tip on even average nights; Galaxy is visible even with a Full Moon; Is seen 12.5° from edge-on
NGC 598	**M33**	Spiral	Triangulum/Pisces ***Triangulum***	**7.5**	2,834,000	5.7	**L,** Is seen 55° from edge-on; Is the third largest galaxy in the Local Group and a satellite of the **Andromeda Galaxy**.
NGC 3031	**M81**	Spiral	Ursa Major	**9**	11,980,000	6.9	**M,** Never gets higher than 57° for the author; Is seen 32° from edge-on
NGC 253	C65	Barred Spiral	Sculptor/Cetus ***Great Sculptor***	**9.5**	10,520,000	7.2	**M-E,** Never gets higher than 29° for the author; Is seen 17° from edge-on; Brightest member of the Sculptor Group of galaxies.
↑All together, the author has found four different galaxies are visible naked-eye from his observing location where the limiting magnitude at the zenith is +7.5.↑							
NGC 4736	**M94**	Spiral	Canes Venatici ***Croc's Eye***	**2.5**	16,660,000	8.2	**S,** Can glimpse expansive outer halo
NGC 3034	**M82**	Irregular	Ursa Major ***Cigar***	**3.5**	12,740,000	8.4	**S-E**
NGC 2403	C7	Barred Spiral	Camelopardalis	**4**	11,080,000	8.5	**M,** Is seen 60° from edge-on
NGC 5194	**M51**	Spiral	Canes Venatici ***Whirlpool***	**4.5**	23,670,000	8.4	**M,** Is seen 60° from edge-on
NGC 4594	**M104**	Spiral	Virgo/Corvus ***Sombrero***	**5.5**	36,920,000	8.0	**S-E,** Is seen 6° from edge-on; Has the second highest surface brightness (+11.6 mag/arcminute^2) of any galaxy on this list.
NGC 4258	**M106**	Barred Spiral	Canes Venatici	**6**	23,730,000	8.4	**S-E**
NGC 5236	**M83^**	Barred Spiral	Hydra/Centaurus ***Southern Pinwheel***	**6**	20,950,000	7.5	**M,** Is seen 66° from edge-on
NGC 221	**M32**	Dwarf Elliptical	Andromeda	**6.5**	2,505,000	8.1	**S+,** Physically very small – only about 7,000 light-years across; Involved with **M31's** expansive glow; Is a satellite of the **Andromeda Galaxy**.
NGC 3627	**M66**	Barred Spiral	Leo ***Leo Triplet***	**6.5**	31,280,000	8.9	**S,** Brightest galaxy in Leo
NGC 4826	**M64**	Spiral	Coma Berenices ***Black Eye***	**6.5**	17,630,000	8.5	**S+,** Brightest galaxy in Coma Berenices
NGC 205	**M110**	Dwarf Spheroidal*	Andromeda	**7**	2,678,000	8.1	**S,** Is a satellite of the **Andromeda Galaxy**.
NGC 4382	**M85**	Lenticular*	Coma Berenices	**7.5**	49,720,000	9.1	**S,** Tied for brightest member of the Virgo Galaxy Cluster in the author's binoculars.
NGC 4472	**M49**	Elliptical	Virgo	**7.5**	52,290,000	8.4	**S,** Tied for brightest member of the Virgo Galaxy Cluster in the author's binoculars.
NGC 5055	**M63**	Spiral	Canes Venatici ***Sunflower***	**7.5**	25,170,000	8.6	**S,** A magnitude +9.3 star lies 4' W.
NGC 5457	**M101**	Barred Spiral	Ursa Major/Boötes ***Pinwheel***	**7.5**	22,360,000	7.9	**M,** Is seen 72° from edge-on; Is tied with **IC 342** for having the lowest surface brightness (+14.9 mag/arcminute^2) on this list; Spans nearly twice the diameter of the **Milky Way**.
NGC 1068	**M77**	Spiral	Cetus ***Cetus A***	**8**	34,510,000	8.9	**S+,** A magnitude +9.4 star lies 11' NE.
NGC 2841	HT49	Spiral	Ursa Major ***Tiger's Eye, Sunflower Junior***	**8**	52,980,000	9.2	**S,** A magnitude +8.6 star lies 5' NE; Member of the Leo Spur of galaxies
NGC 3115	C53	Lenticular*	Sextans ***Spindle***	**8**	33,530,000	8.9	**S**
NGC 4449	C21	Irregular Barred Dwarf*	Canes Venatici ***Box***	**8**	12,600,000	9.6	**S**
NGC 4486	**M87**	Elliptical	Virgo ***Virgo A***	**8**	54,620,000	8.6	**S,** A magnitude +8.7 star lies 6' N; Is the dominant, central galaxy in the Virgo Galaxy Cluster.
NGC 4649	**M60**	Elliptical	Virgo	**8**	55,210,000	8.8	**S**
NGC 5128^	C77	Peculiar*	Centaurus ***Centaurus A***	**8**	12,420,000	6.8	**M,** Never gets higher than 11° for the author
NGC 300	C70	Spiral	Sculptor	**8.5**	6,354,000	8.1	**S,** Never gets higher than 16.5° for the author; Lies between our Local Group and the Sculptor Group of galaxies.

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Designations[1]		Type[2]	Constellation/Nickname[3]	Rtg[4]	Distance[5]	Mag[6]	Comments and Visual Notes**
IC 342	C5	Barred Spiral	Camelopardalis ***Ghost***	**8.5**	11,430,000	9.1	**M,** Is seen 79° from edge-on; Is tied with **M101** for having the lowest surface brightness (+14.9 mag/arcminute^2) on this list; Only "recently" discovered around 1890 by William F. Denning.
NGC 2903	HT51	Barred Spiral	Leo	**8.5**	26,060,000	9.0	**S,** Member of the Leo Spur of galaxies
NGC 3521	HT56	Barred Spiral	Leo	**8.5**	37,170,000	9.0	**S,** Member of the Leo Spur of galaxies
NGC 4214	HT59	Irregular	Canes Venatici	**8.5**	9,716,000	9.8	**S**
NGC 4406	**M86**	Elliptical*	Virgo/Coma Berenices	**8.5**	53,470,000	8.9	**S,** May be a transitional object between elliptical and spindle-type galaxies.
NGC 4631	C32	Barred Spiral	Canes Venatici ***Whale***	**8.5**	16,620,000	9.2	**S-E**
NGC 4725	HT69	Peculiar Barred Spiral*	Coma Berenices	**8.5**	42,600,000	9.4	**S**
NGC 628	**M74**	Spiral	Pisces	**9**	24,070,000	9.4	**S**
NGC 2683	HT47	Spiral*	Lynx/Cancer ***UFO***	**9**	32,440,000	9.8	**S,** Member of the Leo Spur of galaxies
NGC 3368	**M96**	Barred Spiral	Leo	**9**	35,390,000	9.3	**S**
NGC 3379	**M105**	Elliptical	Leo	**9**	36,100,000	9.3	**S**
NGC 3621	HT57	Spiral	Hydra	**9**	21,910,000	9.7	**S,** Member of the Leo Spur of galaxies; Is the most southern object ever discovered by William Herschel.
NGC 3623	**M65**	Barred Spiral	Leo ***Leo Triplet***	**9**	39,890,000	9.3	**S**
NGC 4303	**M61**	Barred Spiral	Virgo	**9**	47,690,000	9.7	**S,** Has an angular separation of 8.2° from **M87**, placing it on the outskirts of the Virgo Galaxy Cluster.
NGC 4321	**M100**	Barred Spiral	Coma Berenices	**9**	52,800,000	9.4	**S**
NGC 4365		Elliptical	Virgo	**9**	70,520,000	9.6	**S,** Is the second brightest non-Messier galaxy in the Virgo Galaxy Cluster. Currently considered one of the most distant galaxies visible in the author's 7x35s.
NGC 4374	**M84**	Elliptical	Virgo/Coma Berenices	**9**	55,330,000	9.1	**S**
NGC 4490	HT63	Peculiar Barred Spiral*	Canes Venatici ***Cocoon***	**9**	20,240,000	9.8	**S**
NGC 4501	**M88**	Spiral	Coma Berenices	**9**	58,660,000	9.6	**S**
NGC 4559	C36	Barred Spiral	Coma Berenices	**9**	25,120,000	10.0	**S,** In telescopes the star 2' E is still much dimmer than the galaxy overall.
NGC 4579	**M58**	Barred Spiral	Virgo	**9**	60,030,000	9.7	**S**
NGC 4699	HT68	Barred Spiral	Virgo	**9**	64,140,000	9.5	**S**
NGC 5005	C29	Barred Spiral	Canes Venatici	**9**	65,150,000	9.8	**S**
NGC 6946	C12	Barred Spiral	Cepheus and Cygnus ***Fireworks***	**9**	18,090,000	8.8	**S,** Has a magnitude +10.1 star 6' S; The brighter open cluster **NGC 6939** lies 0.6° NW.
NGC 55	C72	Barred Spiral	Sculptor/Phoenix ***Surfboard***	**9.5**	6,184,000	7.9	**M-E,** Never gets higher than 15° for the author; Lies between our Local Group and the Sculptor Group of galaxies.
NGC 247	C62	Barred Spiral	Cetus	**9.5**	10,680,000	9.1	**S,** Has a magnitude +9.7 star at its southern tip; Member of the Sculptor Group of galaxies.
NGC 1316	HT13	Peculiar Elliptical*	Fornax ***Fornax A***	**9.5**	62,640,000	8.5	**S,** Brightest member of the Fornax Galaxy Cluster
NGC 1407	SD13	Elliptical*	Eridanus ***Eridanus A***	**9.5**	78,910,000	9.7	**S,** An extremely massive elliptical galaxy and one of the most distant galaxies visible in the author's 7x35s.
NGC 2655	HT48	Barred Lenticular*	Camelopardalis	**9.5**	79,580,000	10.1	**S+,** Has a magnitude +8.6 star 10' SE and 15' W plus one of equal brightness (mag. +9.8) 10' NE; Currently considered one of the most distant galaxies visible in the author's 7x35s.
NGC 3607		Spiral	Leo	**9.5**	69,460,000	9.9	**S,** Currently considered one of the most distant galaxies visible in the author's 7x35s.
NGC 3953	SD48	Barred Spiral	Ursa Major	**9.5**	54,100,000	10.1	**S**

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Designations[1]		Type[2]	Constellation/Nickname[3]	Rtg[4]	Distance[5]	Mag[6]	Comments and Visual Notes**
NGC 4125		Elliptical	Draco/Ursa Major	**9.5**	74,230,000	9.7	**S+,** A star of equal brightness (mag. +9.9) lies only 2.5' E; Currently considered one of the most distant galaxies visible in the author's 7x35s.
NGC 4254	**M99**	Spiral	Virgo	**9.5**	49,550,000	9.9	**S+**
NGC 4278		Elliptical	Coma Berenices	**9.5**	55,160,000	10.2	**S**
NGC 4414	SD54	Spiral*	Coma Berenices/Canes Venatici	**9.5**	59,050,000	10.1	**S+**
NGC 4438	SD56	Lenticular*	Virgo/Coma Berenices ***The Eyes***	**9.5**	37,880,000	10.2	**S,** View is possibly a combination of **NGC 4438** and the +10.8 galaxy **NGC 4435** 5' N.
NGC 4450	SD57	Spiral	Coma Berenices/Virgo	**9.5**	49,190,000	10.1	**S,** Might rate a "9" if it wasn't for the magnitude +9.3 star 4' SW.
NGC 4526	HT65	Mixed Lenticular*	Virgo	**9.5**	47,530,000	9.7	**S,** Lies midway between a magnitude +8.8 star and +8.6 star which are separated by 15'. Is the third brightest non-Messier galaxy in the Virgo Galaxy Cluster.
NGC 4552	**M89**	Elliptical	Virgo	**9.5**	53,720,000	9.8	**S,** Several faint stars nearby
NGC 4569	**M90**	Barred Spiral	Virgo/Coma Berenices	**9.5**	39,890,000	9.5	**S,** Known as an "anemic" galaxy because of the low contrast between its spiral arms and disk.
NGC 4621	**M59**	Elliptical	Virgo	**9.5**	52,190,000	9.6	**S**
NGC 4636	SD62	Elliptical	Virgo	**9.5**	53,070,000	9.5	**S,** Is the brightest non-Messier galaxy in the Virgo Galaxy Cluster and has an angular separation of 10.1° from **M87**, placing it on the outskirts.
NGC 4697	C52	Elliptical	Virgo	**9.5**	39,680,000	9.2	**S**
NGC 4753	SD64	Lenticular*	Virgo	**9.5**	60,670,000	9.9	**S**
NGC 5195	SD67	Peculiar Barred Spiral*	Canes Venatici ***M51b***	**9.5**	23,430,000	9.5	**S,** 8x56 binoculars better separate **NGC 5195** from **M51** and show it to be a "9" if **M51** wasn't so close. Its pairing with **M51** is known as Arp 85.
NGC 5866	HT75	Lenticular*	Draco ***M102***	**9.5**	40,020,000	9.9	**S+,** A star of equal brightness (mag. +9.9) lies 7' to its NE and a magnitude +8.8 star lies 11' SW.
NGC 6822	C57	Irregular Barred Dwarf	Sagittarius ***Barnard's***	**9.5**	1,695,000	8.7	**S,** Is the nearest galaxy on this list and has one of the lowest surface brightnesses (+14.4 mag/arcminute^2) on this list; Discovered in 1884 by Edward Emerson Barnard.
NGC 7331	C30	Spiral	Pegasus	**9.5**	43,850,000	9.5	**S+,** A star of similar brightness (mag. +10.3) lies 8' ENE.
NGC 7793	HT109	Dwarf Spiral*	Sculptor	**9.5**	12,630,000	9.1	**S,** Member of the Sculptor Group of galaxies
NGC 1023	HT10	Barred Lenticular*	Perseus/Andromeda	**10**	35,360,000	9.3	**S+,** Harder to glimpse because it's nestled inside a triangle of roughly 9th-magnitude stars with one (mag. +8.9) only 4' SW and another (mag. +9.0) 7' E.
NGC 1398	HT19	Barred Spiral	Fornax	**10**	64,520,000	9.7	**S,** Has a star of equal brightness (mag. +10.0) 7' W – tough to split with only 7x binoculars.
NGC 3351	**M95**	Barred Spiral	Leo	**10**	32,510,000	9.7	**S**
NGC 3384		Barred Spiral	Leo ***M105 Twin***	**10**	36,590,000	9.9	**S**
NGC 3556	**M108**	Spiral*	Ursa Major	**10**	31,250,000	10.0	**S,** Odd looking because it is a spiral galaxy being viewed edge-on. A little easier to see is the planetary nebula **M97**, which lies only 0.8° SE.
NGC 4473	SD60	Elliptical	Coma Berenices/Virgo	**10**	54,040,000	10.2	**S**
NGC 4494		Elliptical	Coma Berenices	**10**	44,480,000	9.8	**S,** Has a magnitude +7.9 star 7' N.
NGC 4546		Barred Spiral	Virgo	**10**	56,360,000	10.3	**S,** Interestingly, has the highest surface brightness (+11.0 mag/arcminute^2) of any galaxy on this list.
NGC 4565	C38	Spiral	Coma Berenices ***Needle***	**10**	38,490,000	9.6	**S**
NGC 7217		Spiral	Pegasus ***Surprise Comet***	**10**	60,270,000	10.1	**S**

↑All together, the author has found eighty-two galaxies are visible in 7x35 binoculars from his observing location where the limiting magnitude at the zenith in them is +10.1.↑

† *The* brightest, largest, *and* nearest *galaxy in the sky is our very own* ***Milky Way****, which center lies about 28,000 light-years away.*

1 - NGC *stands for 'New General Catalogue',* IC *stands for 'Index Catalogue',* M *stands for 'Messier',* C *stands for 'Caldwell',* HT *stands for its number in Stephen James O'Meara's* Deep-Sky Companions: Hidden Treasures *book, and* SD *stands for its number in Stephen James O'Meara's* Deep-Sky Companions: The Secret Deep.

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2 *- Hubble morphological classifications gleaned by Cliff Mygatt from* Uranometria 2000.0 Deep Sky Field Guide (2nd English edition, 2001)*. Those with an asterisk (*) have had their classification revised in the nearly twenty years since the last edition of the aforementioned book.*
3 *- A commonly accepted nickname that the author liked or an original one he gave it.*
4 *- Rated on a 0-10 scale, where* zero *is easiest to see and* ten *is the hardest to see (in its category).*
5 *- Mean distances, in light-years, extracted from the* NASA/IPAC Extragalactic Database (NED) *on June 12th, 2018.*
6 *- Magnitudes gleaned by Cliff Mygatt from* Uranometria 2000.0 Deep Sky Field Guide (2nd English edition, 2001)*.*
^ *Objects that keen observers, such as O'Meara, have been able to see naked-eye from the Northern Hemisphere. These stand as challenges that very few have bested from the United States (or no further south than latitude 19° N).*
****** *As seen in 7x35 binoculars:* **L (-E)** *= large, large-elongated;* **M (-E)** *= medium, medium-elongated;* **S, S-E, S+** *= small, small-elongated, or stellar.*

Bright Nebulae *– (26 emission/reflection, 24 planetary, and 3 supernova remnants)*

Nebulae are the deep-sky objects with the most nicknames. However, most of those were either made at the eyepiece of a telescope or from a photograph, so don't expect to find their namesakes visible in binoculars. If you find the more diffuse ones to be hard to see, I recommend that you go after the planetary nebulae, whose usually stellar forms pierce light-pollution better than any other one.

Designations[1]		Type[2]	Constellation/Nickname[3]	Rtg[4]	Distance[5]	Mag[6]	Comments and Visual Notes*
NGC 1976	**M42**	EN	Orion ***Great Orion***	**0.5**	1,500	--	**M,** With Theta (θ) Orionis included in rating
NGC 6523	**M8**	EN+OC	Sagittarius ***Lagoon***	**1**	4,300	--	**L,** Rating includes the associated open cluster **NGC 6530** in its eastern side, the associated star 9 Sgr (mag. +5.9) at its center, and the unassociated star 7 Sgr (mag. +6.0) to its west.
NGC 7000	C20	EN	Cygnus ***North America***	**4**	1,800	--	**L,** Lies about 3° ESE of 1st-magnitude Deneb. Most easily spotted by detecting its western edge.
NGC 6618	**M17**	EN	Sagittarius/Serpens Cauda/Scutum ***Swan***	**7.5**	5,900	--	**M,** A magnitude +5.6 star lies 0.4° N.
Sharpless 2-264		EN	Orion ***Lambda Orionis***	**9.5**	--	--	**L,** Huge emission nebula that's brightest part is an arc about 2.5° NW of the loose open cluster **Collinder 69** (the Head of Orion).
NGC 6853	**M27**	PN	Vulpecula ***Dumbbell***	**9.5**	1,010 ± 290	7.4	**S,** Star 14 Vul (mag. +5.7) lies 0.4° N; Apparent size is growing by about 7" per century.
NGC 7293	C63	PN	Aquarius ***Helix***	**10**	685 ± 195	7.3	**M,** Suspected with the unaided eye though it never gets higher than 33.5° for the author! It's a large 12' circular glow in binoculars that's paradoxically faint even in them.
↑All together, the author has found seven different nebulae are visible naked-eye from his observing location where the limiting magnitude at the zenith is +7.5.↑							
NGC 3242^	C59	PN	Hydra ***Ghost of Jupiter***	**1.5**	3,360 ± 945	7.7	**S+,** Blue color; would be visible naked-eye if not for the fact that it doesn't get higher than 35° for the author.
NGC 6543	C6	PN	Draco ***Cat's Eye***	**2.5**	3,750 ± 1,045	8.1	**S+,** A fainter magnitude +9.7 star lies only 3' NW; Light blue color
NGC 7009	C55	PN	Aquarius ***Saturn***	**3.5**	4,110 ± 1,175	8.0	**S+,** Magnitude +4.5 Nu (ν) Aql lies 1.3° E; Light blue color
NGC 6572	HT90	PN	Ophiuchus ***Blue Racquetball***	**4**	4,760 ± 1,370	8.1	**S+,** A much fainter magnitude +9.4 star lies about 4' ENE.
IC 418	HT28	PN	Lepus ***Raspberry Ring***	**5**	4,400 ± 1,270	9.3	**S+,** Current catalogues incorrectly place it at +9.3 while the author sees it as +8.65; Light blue color
NGC 2237, 38, 46^	C49	EN	Monoceros ***Rosette***	**5**	5,400	--	**L,** Possibly naked-eye, but hard to confirm that *it* is the glow the author sees around the open cluster **NGC 2244** and not just unresolved stars.
NGC 6210	HT78	PN	Hercules ***Turtle***	**5**	6,685 ± 1,890	8.8	**S+,** Has a magnitude +9.5 star 4.5' NE and a +8.4 star 9' SE
NGC 7662	C22	PN	Andromeda ***Light Blue Snowball***	**5**	4,435 ± 1,240	8.2	**S+,** Magnitude +5.8 13 And lies 0.5° NE with a mag. +9.0 star 8' E. Is part of the outline of a "heart" asterism 0.7° across discovered by Cloudy Nights member Philipp. Light blue color
IC 1848		EN	Cassiopeia ***Soul***	**~6**	6,500	--	**L,** Very unmistakable elongated patch of bright sky – tough to tell how much is from unresolved stars in the **Milky Way** though.
NGC 2068	**M78**	RN	Orion	**6**	1,600	--	**S,** Rating includes the combined glow of the close magnitude +10.4 and +10.6 stars near its center, which illuminate the nebula.
NGC 2175	HT37	EN	Orion	**6**	6,400	--	**M,** Has a magnitude +7.6 star just W of its middle.
NGC 6514	**M20**	EN/RN	Sagittarius ***Trifid***	**6**	5,400	--	**M,** Visible as a bright glow (the emission nebula) around a magnitude +7.0 star (actually a close double star) and a faint glow (the reflection nebula) around a magnitude +7.4 star 8' N.
Longmore-Tritton 5		PN	Coma Berenices	**6.5**	2,970 ± 850	--	Only its magnitude +8.9 central star is visible. Actually, it's a binary central star and what's responsible for ionizing the nebula is its invisible hot dwarf companion.
NGC 6826	C15	PN	Cygnus ***Blinking***	**6.5**	4,565 ± 1,305	8.8	**S+,** The 6th-magnitude 40" wide double star 16 Cygni lies only 0.5° to the W.
NGC 7027	HT104	PN	Cygnus ***Pink Pillow***	**6.5**	3,065 ± 880	8.5	**S+,** Probably the most studied planetary nebula ever by professional astronomers.
NGC 281^	HT3	EN	Cassiopeia ***Pacman***	**7**	9,600	--	**M,** The brightest "star" in the nebula is the small magnitude +6.3 open cluster **IC 1590**.
NGC 1499		EN	Perseus ***California***	**7**	1,000	--	**L,** Brightest edge lies 1° NE of Xi (ξ) Persei; Visible naked-eye with certain filters. Discovered visually in 1885 by Edward Emerson Barnard.
NGC 2024	HT34	EN	Orion ***Flame***	**7**	1,300	--	**M,** Circular apparition of faint light 15' ENE of Zeta (ζ) Orionis. Like a ghost of Zeta not seen to the side of the other two stars in Orion's Belt.

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Designations[1]		Type[2]	Constellation/Nickname[3]	Rtg[4]	Distance[5]	Mag[6]	Comments and Visual Notes*
NGC 2467	HT43	EN	Puppis	**7**	13,000	7.1	**S,** Its illuminating star is magnitude +9.4 and lies just N of center.
NGC 6720	**M57**	PN	Lyra ***Ring***	**7.5**	3,000 ± 850	8.8	**S+,** Two stars of equal brightness lie nearby – a magnitude +8.8 star 12' N and a magnitude +8.9 star 13' E.
NGC 1435^		RN	Taurus ***Merope***	**8**	440	--	**M,** Is a distinctly blue swath S of Merope with its curving E and SE edge (paralleling a row of progressively fainter 7th- and 8th-magnitude stars) the most distinct.
NGC 1514	SD15	PN	Taurus/Perseus ***Crystal Ball***	**8**	2,220 ± 650	10.9	Only its magnitude +9.4 central star is visible.
NGC 1952	**M1**	SNR	Taurus ***Crab***	**8**	6,500	--	**S,** Apparent size is growing by about 30" per century.
NGC 1977, 73, 75	HT32	EN	Orion	**8**	1,500	--	**M,** Also known as **Sharpless 2-279**; Has some surprisingly defined edges; Involved with a loose gathering of bright stars.
NGC 1982	**M43**	EN	Orion ***Comma***	**8**	1,500	--	**S,** Tightly surrounds a magnitude +6.9 star and can be tough to separate from.
NGC 1535	HT24	PN	Eridanus ***Cleopatra's Eye***	**8.5**	5,805 ± 1,630	9.6	**S+**
NGC 2392	C39	PN	Gemini ***Eskimo***	**8.5**	4,500 ± 1,305	9.1	**S+,** A magnitude +8.8 star lies only 1.6' N, making it extremely difficult to rate its visibility with only 7x binoculars.
NGC 3587	**M97**	PN	Ursa Major ***Owl***	**8.5**	2,575 ± 720	9.9	**S,** Fairly easy to find only 2.3° WSW of Beta (β) UMa.
NGC 7023	C4	RN	Cepheus ***Iris***	**8.5**	1,400	--	**S,** With averted vision, nebula appears to "grow" out from around a magnitude +7.3 star and give the star a noticeable out-of-focus look.
IC 1805		EN	Cassiopeia ***Heart***	**9**	6,000	--	**M**
NGC 1360	HT16	PN	Fornax ***Robin's Egg***	**9**	1,825 ± 520	9.4	**S,** A faint magnitude +9.9 star lies 13' S of its little disk.
NGC 1999	HT33	RN	Orion ***The 13th Pearl***	**9**	1,500	--	**S+,** Tiny ball of nebula with a magnitude +10.6 star at its center visible in telescopes.
Sharpless 2-276^	SD26	SNR	Orion ***Barnard's Loop, Herschel's Region #27***	**9**	1,500	--	**L,** Brightest part of **Barnard's Loop** – NE of **M78** by a little over 1°. Best found by comparing sky to area just NW of 56 Orionis.
NGC 2359	SD35	EN/RN	Canis Major ***Thor's Helmet***	**9**	1,600	--	**S,** Shows strong enhancement with certain nebula filters.
IC 4593	SD71	PN	Hercules/Serpens Caput ***White-Eyed Pea***	**9**	8,705 ± 2,445	10.7	**S+,** A magnitude +9.3 lies only 5' N; Current catalogues incorrectly place it at +10.7 while the author sees it as +9.95; View may include variable central star; Only discovered in 1907 by Williamina Fleming of Harvard College.
NGC 6726/27		RN	Corona Australis/Sagittarius	**9**	425	--	**S,** The double star B 957 (7.3/9.6 57") at its center is just splittable in the author's 8x56s.
NGC 6818	HT99	PN	Sagittarius ***Little Gem***	**9**	6,130 ± 1,730	9.3	**S+,** A star of similar brightness (mag. +9.4) lies 8' SE. In the author's 8x56s the nearby Local Group galaxy **NGC 6822** is visible.
IC 4997		PN	Sagitta/Delphinus	**9**	15,810 ± 5,085	10.5	**S+,** Though just bright enough to be seen by itself, it's only 1' from a magnitude +10.0 star, so I'm seeing their combined light. Very possibly the farthest planetary nebula visible on this list – not to mention the youngest. Discovered around 1896 by Williamina Fleming.
NGC 6992/95	C33	SNR	Cygnus ***East Veil***	**9**	1,500	--	**S-E,** Apparent size is growing by 6" per century.
NGC 650/51	**M76**	PN	Perseus ***Little Dumbbell***	**9.5**	3,030 ± 850	10.1	**S+,** A magnitude +8.4 star lies 13' E and a magnitude +9.6 star lies 9' W. Is barely visible on best of nights while near the zenith.
NGC 1333	HT15	RN	Perseus/Aries/Taurus ***Embryo***	**9.5**	1,100	--	**S,** View is a combined image of its magnitude +10.5 star and nebula.
NGC 1931	SD23	EN/RN	Auriga ***The Fly***	**9.5**	7,000	--	**S+,** Telescopes reveal a tight triple star at its center.
NGC 2261	C46	RN/EN	Monoceros ***Hubble's Variable***	**9.5**	2,500	--	**S,** January 2016 brightness rating; Brightest variable nebula (~10th-magnitude) in the sky.
NGC 2440	HT41	PN	Puppis ***Albino Butterfly***	**9.5**	4,205 ± 1,205	9.4	**S+,** A magnitude +9.3 star lies about 3' E – would rate a "9" if farther away. 8x56 binoculars reveal a tiny Jupiter-sized disk.
NGC 3132	C74	PN	Vela/Antlia ***Southern Ring***	**9.5**	3,650 ± 1,045	9.2	**S+,** Never gets higher than 13.5° for the author; View is a combined image of its magnitude +10.1 "central star" and nebula.
IC 3568	HT64	PN	Camelopardalis ***Sliced Lime***	**9.5**	8,865 ± 2,510	10.6	**S+,** A star just a tad dimmer (mag. +10.1) lies 7' E; Current catalogues incorrectly place it at +10.6 while the author sees it as +10.1; Discovered in 1900 by Robert Grant Aitken.
IC 4603		RN	Ophiuchus/Scorpius	**10**	--	--	**S,** With averted vision, nebula appears to "grow" out from around a magnitude +8.0 star and give the star an out-of-focus look.

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Designations[1]		Type[2]	Constellation/Nickname[3]	Rtg[4]	Distance[5]	Mag[6]	Comments and Visual Notes*
NGC 6302	C69	PN	Scorpius ***Bug***	**10**	2,085 ± 585	9.6	**S+,** A star of similar brightness (mag. +9.6) lies 10' SW; Takes best of nights since it never gets higher than 17° for the author.
BD +30°3639		PN	Cygnus ***Campbell's Hydrogen Envelope Star***	**10**	7,235 ± 2,055	11.3	Only its magnitude +10.0 central star is visible; Also known as **PK 64+5.1** or **Henize 2-438.** Discovered in 1890 by Williamina Fleming.

↑All together, the author has found forty-six nebulae are visible in 7x35 binoculars from his observing location where the limiting magnitude at the zenith in them is +10.1.↑

[1] - NGC *stands for 'New General Catalogue',* IC *stands for 'Index Catalogue',* M *stands for 'Messier',* C *stands for 'Caldwell',* HT *stands for its number in Stephen James O'Meara's* Deep-Sky Companions: Hidden Treasures *book, and* SD *stands for its number in Stephen James O'Meara's* Deep-Sky Companions: The Secret Deep. Sharpless *is from Stewart Sharpless's 1959 revised version of his 1953 catalogue of emission nebulae.*

[2] - EN = *emission nebula;* RN = *reflection nebula;* PN = *planetary nebula;* SNR = *supernova remnant.*

[3] - *A commonly accepted nickname that the author liked or an original one he gave it.*

[4] - *Rated on a 0-10 scale, where* zero *is easiest to see and* ten *is the hardest to see (in its category). Gauging the visibility of a diffuse nebula involved with stars is tricky because when employing averted vision, some of the starlight can appear scattered and thus create a false brightening around them.*

[5] - *All distances are in light-years. The ones for the planetary nebulae are from Frew D.J., Parker Q.A., Bojičić I.S. 2016, MNRAS, 455, 1459 and were rounded off while all others were extracted from various sources.*

[6] - *Magnitudes gleaned by Cliff Mygatt from* Uranometria 2000.0 Deep Sky Field Guide (2nd English edition, 2001).

^ *Objects that keen observers, such as O'Meara, have been able to see naked-eye from the Northern Hemisphere. These stand as challenges that very few have bested from the United States (or no further south than latitude 19° N).*

***** *As seen in 7x35 binoculars:* **L (-E)** *= large, large-elongated;* **M (-E)** *= medium, medium-elongated;* **S, S-E, S+** *= small, small-elongated, or stellar (so not as sensitive to the effects of light-pollution as other nebulae).*

Dark Nebulae† (aka Absorption Nebulae)

Of all the different types of deep-sky objects, your ability to see dark nebulae will be the one that hinges the most on how dark your skies are. Thanks to our ever brightening skies however, they're first on astronomers "endangered species" list. Remember that using averted vision works great to see them; it's just that instead of seeing an object grow brighter, dark nebulae grow darker. Which only adds to how strange it is to be looking for inky voids of stars…

Designations[1] Main*	Alternate	Opacity[2]	Constellation(s)	Rating[3]	Comments and Visual Notes
Le Gentil 3	LDN 1005	--	Cygnus	Super Easy	7° x 2.5° gash north of Deneb in Cygnus; Its SE end consists of **LDN 972**, **974**, and **989**, which together form the naked-eye grouping **LDN ID #239**; Its middle consists of **LDN 1005** while its much larger NW end consists of **LDN 996**, **998**, **1011**, and many more; Nicknamed the "Funnel Cloud" nebula by Canadian amateur Alan Whitman.
LDN ID #274, #276, #283	LDN 1305, 1335, 1328, 1336, 1349	1, 1, 3, 3, 1	Cassiopeia	Easy	A very long east-west streak just a few degrees north of Eta (ε) Cassiopeiae that the author has nicknamed the "Cassiopeia Streak". In 8x56 binoculars has one of the "dustiest" appearances of any dark nebulae he's seen.
B59, 65, 66, 67	LDN 1746, 1772, 1768, 1773	5, 6, 6, 6	Ophiuchus	Easy	Is the "stem" of the **Pipe Nebula**; Major part of the **Great Dark Horse Nebula**
B78	LDN 42	5	Ophiuchus	Easy	Is the "bowl" of the **Pipe Nebula**; Slightly more diffuse than "stem"; Major part of the **Great Dark Horse Nebula**
B79, 276	LDN 216, 269	6, 2	Ophiuchus	Easy	Part of the **Great Dark Horse Nebula**
LDN ID #141	LDN 653, 659, 660, 665, 666	2, 3, 1, 3, 4	Hercules/Ophiuchus	Easy	Very large elongated patch running north-south 5.5° west of Zeta (ζ) Aquilae
Northern Coalsack	--	?	Cygnus	Easy	O'Meara's *Hidden Treasures* object 102; Nearly fills the void between Alpha (α), Gamma (γ), and Eta (η) Cygni. Contains several smaller dark nebulae such as **LDN 896**.
B168, LDN 1010, 1020	LDN 1055	3, 4, 3	Cygnus	Easy	The author easily sees a large dark patch at its location while he finds it takes the rarest of nights to be able to really glimpse the most famous part of **B168** – which is a 1°-long strip running out of it to the west known as the "Road to the Cocoon".
LDN 1238	--	2	Cassiopeia	Easy	Very large 6° x 2° patch west of Cassiopeia's "W" and just south of the open cluster **M52**.
B8, 9, 11, 13	LDN 1392, 1396, 1402	5, 3, 4	Camelopardalis	Moderate	A large elongated naked-eye patch of dark sky a few degrees north of the naked-eye open cluster **NGC 1528**; Also known as **LDN ID #315**.
B256	LDN 1749	5	Ophiuchus	Moderate	Small patch a few degrees south of the **Pipe Nebula**.
B262	LDN 91	4	Ophiuchus	Moderate	Part of the **Great Dark Horse Nebula**
B268, 270	LDN 178, 185	4, 5	Ophiuchus	Moderate	Part of the **Great Dark Horse Nebula**
B106, 107, 110, 111, 113	LDN 530, 534, 548	6, 3, 5	Scutum/Aquila	Moderate	Large patch just NW of the open cluster **M11**; **B111** is the dark nebula that encompasses all the other listed Barnard dark nebulae, so it's what the area is usually called.
B141	LDN 632	1	Aquila	Moderate	A fair sized patch a few degrees SW of Delta (δ) Aql.
B144	LDN 857	1	Cygnus	Moderate	A large, noticeable dark patch most prominent NW of Eta (η) Cyg; Known as the "Fish on a Platter" nebula.
B164, LDN 1066, 1073	LDN 1070	5, 3, 2	Cygnus	Moderate	Can be seen as a large dark patch just north of an imaginary line between Pi^1 (π^1) and Pi^2 (π^2) Cygni.
Cepheus Flare	LDN 1241	1	Cepheus	Moderate	Lies above a line between Gamma (γ) and Beta (β) Cephei. **LDN 1241** is the designation of the northern half while the southern half seems to have none.
B169, 170, 171	LDN 1151, 1149, 1153	3, 4, 5	Cepheus	Moderate	A dark patch between Zeta (ζ) Cephei and Mu (μ) Cephei.
B18, 208, 210, 212, 215,	LDN 1529, 1524	5, 5	Taurus	Hard	Also known as **LDN ID #169**; Part of the "Taurus Dark Cloud" complex
B7, 19, 22, 209, 211	LDN 1495, 1521	5, 4	Taurus	Hard	Also known as **LDN ID #169**; Nicknamed the "Taurus Dark Cloud" nebula

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Designations[1] Main*	Alternate	Opacity[2]	Constellation(s)	Rating[3]	Comments and Visual Notes
B137, 138	LDN 618, 627	3, 2	Aquila	Hard	Great curved, semi-vacant lane over 3° in length. Runs north to south with its concave side to the east.
B140	LDN 642	3	Aquila	Hard	Is a fair sized patch on the east edge of the **Great Rift** framed on all sides in binoculars by four 7th-magnitude stars.
B330	LDN 647	4	Aquila	Hard	Is a noticeable fair sized patch on the east edge of the **Great Rift** with an 8th-magnitude star at its top and bottom.
B143	LDN 694	6	Aquila	Hard	A fair sized patch just a few degrees west of Gamma (γ) Aql; Top two-thirds of "Barnard's E" nebula
LDN 864	--	3	Cygnus	Hard	A little known elongated dark patch that lies between the triangle formed by Eta (ε) Cygni, 47 Cygni, and 48 Cygni.
B361	LDN 970	4	Cygnus	Hard	Dark spot just off south edge of the much larger **Le Gentil 3** – would be easier to see if it actually wasn't so close to it!
↑The author has found over two dozen different dark nebulae that are distinctly visible naked-eye from his observing location where the limiting magnitude at the zenith is +7.5.↑					
B44	LDN 1712	5	Ophiuchus/Scorpius	Easy	A long east-west streak that the author suspected naked-eye on only one superb morning.
B53	SL 32	4	Scorpius	Easy	A small patch several degrees east of Eta (ε) Sco and just above **B50**.
B64	LDN 173	6	Ophiuchus	Easy	The globular cluster **M9** lies on its east edge; Part of the **Great Dark Horse Nebula**
B63	LDN 99	3	Ophiuchus	Easy	Possibly visible naked-eye; Part of the **Great Dark Horse Nebula**
LDN 1795	--	4	Scorpius/Sagittarius	Easy	A noticeable horizontal streak of darkness that lies a few degrees west of Gamma (γ) Sgr.
B312	LDN 379	4	Scutum/Sagittarius	Easy	A large patch SE of Gamma (γ) Sct
B117a, 119a	LDN 534	3	Scutum/Aquila	Easy	A fair sized patch just east of the great curving dark nebula complex **B111**.
LDN 792, 798	--	4, 3	Vulpecula	Easy	A noticeably dark clump that lies east of Alpha (α) Vul and the open cluster **Stock 1** but just west of 10 Vul
LDN 935	--	4	Cygnus	Easy	Is the "Gulf of Mexico" and "East Coast" of the **North America Nebula** (**NGC 7000**).
B352	--	5	Cygnus	Easy	In binoculars its triangular form can be seen seemingly jutting into the north edge of the naked-eye nebula **NGC 7000**.
LDN 966	--	4	Cygnus	Easy	Just south of the darkest and widest part of **Le Gentil 3**.
B12	LDN 1407	5	Camelopardalis	Moderate	A fair sized patch just east of the elongated naked-eye patch of **B8**, **B9**, **B11**, and **B13**.
B45	LDN 1744	5	Ophiuchus	Moderate	A less prominent strip of dark nebula just above **B44**.
B50	SL 30	6	Scorpius	Moderate	Small patch several degrees east of Eta (ε) Sco and just below **B53**.
B244	LDN 1736	5	Ophiuchus	Moderate	A small patch that lies just south of the **Pipe Nebula's** western tip.
B259	LDN 177	4	Ophiuchus	Moderate	Part of the **Great Dark Horse Nebula**
B289	LDN 35	4	Sagittarius	Moderate	This is only the middle and leftmost of three nearly parallel dark streaks about 1°-long aligned NNE to SSW; I've nicknamed it "The Scratch" after its strong appearance in 8x56 binoculars. Lies 2.5° NW of Gamma (γ) Sagittarii
B295	LDN 1798	4	Sagittarius	Moderate	A fair sized dark patch a degree SW of Gamma (γ) Sgr.
B90	LDN 227	5	Sagittarius	Moderate	Tiny round inky spot half a degree ENE of a 6th-magnitude star in a very bright star field above Gamma (γ) Sgr.
B305	--	--	Sagittarius	Moderate	A fair sized dark patch almost midway between Gamma (γ) and Eta (ε) Sgr.
B92	LDN 323	6	Sagittarius	Moderate	Small, oval shaped nebula on the north edge of the **Small Sagittarius Star Cloud** (**M24**).
B103	LDN 497	6	Scutum	Moderate	A fair sized patch just NW of an imaginary line between Alpha (α) and Beta (β) Sct.
B133	LDN 531	6	Aquila	Moderate	Very small spot about 2° south of Lambda (λ) Aql.
B142	LDN 688	6	Aquila	Moderate	Bottom one-third of "Barnard's E" nebula – of which the top two-thirds consists of the naked-eye patch **B142**.
B356	LDN 950	5	Cygnus	Moderate	A small patch that lies just north of **B352** and the naked-eye nebula **NGC 7000**.
LDN 954	--	3	Cygnus	Moderate	A small patch that lies just north of **B356**, **B352** and the naked-eye nebula **NGC 7000**.
B364	LDN 1074	5	Cygnus	Moderate	A small spot that lies in far northern Cygnus and just south of **B160** and the naked-eye open cluster **Trumpler 37**.
LDN 298	--	3	Sagittarius	Hard	Is known from photos as the dark extension south of **B84a** (which sadly isn't visible in 7x35s).
B93	LDN 327	4	Sagittarius	Hard	Small, skinny shaped nebula on the north edge of the **Small Sagittarius Star-Cloud** (**M24**) and just east of **B92**.
B334, 336, 337	LDN 701, 702, 705	4, 5, 4	Aquila	Hard	Small dark area only noticeable with much effort a few degrees NW of Gamma (γ) Aql and the much more prominent dark nebula patch of **B142** and **B143**.

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Designations[1] Main*	Alternate	Opacity[2]	Constellation(s)	Rating[3]	Comments and Visual Notes
B155, 156	LDN 983	3	Cygnus	Hard	A small, hard to notice patch just SW of Rho (ρ) Cyg.
B160	LDN 1088	4	Cepheus	Hard	Small dark spot just south of the naked-eye open cluster **Trumpler 37** in far southern Cepheus.
↑The author has found over two dozen dark nebulae that are distinctly visible in 7x35 binoculars from his observing location where the limiting magnitude at the zenith in them is +10.1.↑					

† *The* largest *dark nebula in the sky is the* ***Great Rift****, which under a dark sky spans from Cygnus to Centaurus.*

[1] - B *stands for 'Barnard' – which is from E.E. Barnard's catalogue,* LDN *stands for 'Lynds Dark Nebula' – which is from Dr. Beverly T. Lynds' catalogue, and* SL *stands for 'Sandqvist-Lindroos' – which is from a catalogue compiled by Aage Sandqvist and K. P. Lindroos. Besides giving a catalogue number for each dark nebula she found visually on plates taken during the* National Geographic Society – Palomar Observatory Sky Survey *(POSS), Dr. Lynds also assigned* identification numbers (ID #) *to some. These were for large dark clouds "with several sections of different opacity" contained within them.*

[2] *- Lynds opacity scale. In this 1-6 scale, the most opaque dark nebulae are classed as* six *while the least opaque are classed as* one*.*

[3] *- Rated on a four-part scale of increasing difficulty (Super Easy, Easy, Moderate, and Hard) as devised by the author.*

***** *Visually, dark nebulae rarely have defined borders between each one that holds a designation in a "cloud". That's why the author has chosen to list all the dark nebulae that make up each "cloud" that he sees visually in groups instead of separately.*

Globular Star Clusters†

They may not be the rarest deep-sky object visible in binoculars, but they nearly are in the Milky Way. That's because our Galaxy – much unlike our sister galaxy, Andromeda – contains well less than 200 in total. What I find amazing about seeing them naked-eye is their distances considering most of the naked-eye deep-sky objects lie within 10,000 light-years . In fact, only eight galaxies lie farther and have been seen naked-eye!

Designations[1]		Class[2]	Constellation/Nickname[3]	Rtg[4]	Distance[5]	Mag[6]	Comments and Visual Notes
NGC 6656	**M22**	VII	Sagittarius ***Great Sagittarius***	**5.5**	10,400	5.10	Globular cluster with the third highest listed magnitude.
NGC 6205	**M13**	V	Hercules ***Great Globular***	**6**	23,100	5.78	Though considered a bright naked-eye spectacle of the Northern Celestial Hemisphere, seven globular clusters have brighter listed magnitudes than it.
NGC 5272	**M3**	VI	Canes Venatici/Boötes	**6.5**	33,200	6.19	A magnitude +6.4 star lies 0.5° SW.
NGC 5904	**M5**	V	Serpens Caput	**6.5**	24,400	5.65	Magnitude +5.1 star 5 Serpentis lies only 20' SE; Brighter than **M3**, but closer to its "own" star.
NGC 5139	C80	VIII	Centaurus ***Omega (ω) Centauri***	**7**	16,900	3.68	Visible naked-eye though it never gets higher than 6.5°; Appears elongated in binoculars
NGC 7078	**M15**	IV	Pegasus	**7.5**	33,900	6.20	A magnitude +6.1 star lies only 20' to its E.
NGC 6341	**M92**	IV	Hercules	**8**	27,000	6.44	The "forgotten" naked-eye globular cluster in the Northern Celestial Hemisphere.
NGC 7089	**M2**	II	Aquarius	**8**	37,500	6.47	One of the farthest objects *in* the Galaxy visible with the naked-eye.
NGC 6254	**M10**	VII	Ophiuchus	**8.5**	14,300	6.60	The magnitude +5.0 star 30 Oph lies 1.0° E.
NGC 6121	**M4***	IX	Scorpius	**9**	7,200	5.63	While glare from Antares hinders viewing, it's a great test of transparency! Is the closest globular cluster, but only by a statistically insignificant 600 light-years over **NGC 6397** in Ara.
NGC 6809	**M55**	XI	Sagittarius	**9.5**	17,600	6.32	Rare to glimpse – takes best of nights since it never gets higher than 23° for the author.
NGC 6218	**M12**	IX	Ophiuchus	**10**	15,600	6.70	Though **M12** is the twelfth brightest one from the author's location, 18 are technically brighter.
↑All together, the author has found twelve different globular clusters are visible naked-eye from his observing location where the limiting magnitude at the zenith is +7.5.↑							
NGC 6266	**M62^**	IV	Ophiuchus/Scorpius	**0.5**	22,100	6.45	Is right at the edge of naked-eye visibility. Dimmed by 1.2 magnitudes from interstellar dust.
NGC 6273	**M19^**	VIII	Ophiuchus	**0.5**	28,700	6.77	Is right at the edge of naked-eye visibility.
NGC 6626	**M28**	IV	Sagittarius	**1.5**	17,900	6.79	
NGC 7099	**M30**	V	Capricornus	**1.5**	26,400	7.19	The magnitude +5.3 star 41 Cap lies 0.4° E; Almost seems *brighter* than **M28**.
NGC 6093	**M80**	II	Scorpius	**2.5**	32,600	7.33	Nearly stellar; Has a magnitude +8.5 star 4' NE and a magnitude +8.7 star 8' S.
NGC 6402	**M14**	VIII	Ophiuchus	**2.5**	30,300	7.59	
NGC 6541^	C78	III	Corona Australis	**3**	24,500	6.30	Never gets higher than 10.5° for the author.
NGC 6388, NGC 3201^, NGC 6723, NGC 1851^, NGC 6441, NGC 5986, M54, M53, M69, M9, M79^, NGC 6544, M68^, NGC 6624, M70, M107, NGC 6553, NGC 288, NGC 6712, M71, NGC 6293, NGC 6304, NGC 6356, NGC 6522, M56, NGC 6316, M75, NGC 5897, NGC 6284, NGC 6934, NGC 6638, NGC 5466, NGC 5824, NGC 6366, M72, NGC 6229, NGC 6235, NGC 5694, NGC 4147							
↑All together, the author has found forty-six globular clusters are visible in 7x35 binoculars from his observing location where the limiting magnitude at the zenith in them is +10.1.↑							

† *Of the 157 objects classified as globular clusters belonging to our Galaxy, the author have seen over one third (58) with just 7x35 binoculars. Of the 94 listed in Harris's paper as having magnitudes brighter than +10.0, only ten never rise above the author's horizon.*

[1] - NGC *stands for 'New General Catalogue',* IC *stands for 'Index Catalogue',* M *stands for 'Messier', and* C *stands for 'Caldwell'.*

[2] - *The Shapley-Sawyer Concentration Class (I - XII) denotes how condensed a globular cluster is by having* I *stand for most concentrated and* XII *stand for least.*

[3] - *A commonly accepted nickname that the author liked or an original one he gave it.*

[4] - *Rated on a 0-10 scale, where* zero *is easiest to see and* ten *is the hardest to see (in its category).*

[5] – *All distances are in light-years. From* Catalog of Parameters For Milky Way Globular Clusters *by William E. Harris (*Harris, W.E. 1996, AJ, 112, 1487), 2010 edition.

[6] - *Magnitudes from* Catalog of Parameters For Milky Way Globular Clusters *by William E. Harris (*Harris, W.E. 1996, AJ, 112, 1487), 2010 edition.

^ *Objects that keen observers, such as O'Meara, have been able to see naked-eye from the Northern Hemisphere. These stand as challenges that very few have bested from the United States (or no further south than latitude 19° N).*

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***** *While **M4** in Scorpius is considered the closest globular cluster, the farthest on the author's list is **NGC 5694** in Hydra at a distance of 114,000 light-years. The second farthest globular cluster on it is **NGC 5824** in Lupus (105,000 light-years) while the third farthest is **NGC 6229** in Hercules (99,000 light-years) and the fourth farthest is **M54** in Sagittarius – which is 86,400 light-years away but 2.5 magnitudes brighter than **NGC 5824**.*

Open Star Clusters *– (61 open clusters and 3 OB Associations)*

I honestly don't get too excited about viewing open clusters and OB Associations. That's partly because they're the most populous of all the deep-sky objects visible in small instruments. But I'm proud to have viewed most of the ones on my list naked-eye many times and even "discovered" several while using binoculars. So, if you're like me, just remember that my list constitutes only the ones bright enough to be visible *naked-eye*. They don't get any brighter than that!

Designations[1]		A.V.S.[2]	Constellation/Nickname[3]	Rtg[4]	Distance[5]	Mag[6]	Comments and Visual Notes
Melotte 22	**M45****	L	Taurus ***Pleiades***	**0**	442	1.5	I can see upwards of 11 to 13 Pleiads with the naked-eye.
NGC 6475	**M7****	L	Scorpius ***Ptolemy***	**0.5**	906	3.3	Can resolve several stars
Melotte 20**	HT14	VL	Perseus ***Alpha Persei***	**1**	572	2.3	Also known as **Collinder 39**; The cluster is only a small portion of the much larger and looser **Perseus OB3 Association**.
IC 4715	**M24**	L	Sagittarius/Scutum ***Small Sagittarius Star Cloud***	**1.5**	~14,000	2.5	Commonly referred to as a star cloud, it is a section of a far interior spiral arm of our Galaxy (the Norma arm) framed by the dust clouds of the nearer Sagittarius-Carina spiral arm.
NGC 2632	**M44****	L	Cancer ***Beehive, Praesepe***	**2**	605	3.1	Can resolve two stars and some clumps
NGC 869 & 884	C14	L	Perseus ***h & χ Persei***, ***Double Cluster***	**2.5**	7,630	5.3 / 6.1	The nucleus of the **Perseus OB1 Association**; Visible as two distinct clusters with clumps of stars; Is barely brighter than nearby galaxy **M31**; For the average observer in the Northern Hemisphere, these are the farthest open clusters visible.
Collinder 69**	HT29	L	Orion ***Lambda Orionis***	**2.5**	1,310	2.8	Very loose cluster consisting of roughly 20 stars centered on mag. +3.5 Lambda (λ) Orionis.
NGC 6231	C76	S	Scorpius ***False Comet's Head***, ***Phi Scorpii***	**3**	5,275	2.6	Part of the **Scorpius OB1 Association**. With the naked-eye, it resembles the head of a comet with **Trumpler 24** and the rest of **Scorpius OB1** above it being the tail.
Melotte 25**	C41	VL	Taurus ***Hyades***	**3.5**	153	0.5	Also known as **Collinder 50**; Is the closest open cluster on this list; Aldebaran is not a true member and not included in rating.
NGC 2422	**M47****	M	Puppis	**3.5**	1,555	4.4	Can resolve one star and a clump; Extreme contrast to open cluster **M46** 1.3° E in binoculars.
NGC 2451**	HT42	S	Puppis ***Tangerine Gemstone***	**3.5**	--	2.8	While most of the stars that make up the naked-eye view of **NGC 2451** are unrelated to each other and thus form only an asterism, a few are part of a cluster 630 l-y away now known as **NGC 2451A**. In binoculars, more of its members are visible along with some that belong to an even more distant (1,190 l-y) line-of-sight cluster known as **NGC 2451B**. Rating includes all stars – even the bright (mag. +3.6) orange star c Pup (a possible member of **NGC 2451B**).
Melotte 111**	HT62	VL	Coma Berenices ***Coma***	**3.5**	283	1.8	Also known as **Collinder 256**; Has the largest angular separation from the galactic plane of any cluster on this list; Is the second closest open cluster on this list.
Collinder 399**	HT97	L	Vulpecula ***Coathanger***	**3.5**	--	3.6	Not a true open cluster but instead a bright asterism.
NGC 6871		S	Cygnus	**4.0**	6,005	5.2	Possibly part of the **Cygnus OB3 Association**.
Trumpler 37**	HT105	M	Cepheus	**4.0**	2,980	--	Sometimes listed as magnitude +5.1; The cluster and involved nebula were discovered photographically and are known jointly as **IC 1396**. The author can see the magnitude +5.6 star at its center naked-eye but it takes his 8x56s to discern the large, dim glow of the nebula.
Cepheus OB2**		VL	Cepheus	**4.0**	2,380	5.0	Rating is really just of the loose gathering of stars between Alpha (α) and Delta (δ) Cephei.
NGC 2244	C50	M	Monoceros	**4.5**	5,050	4.8	The star 12 Monocerotis is not a true member but part of naked-eye rating.
NGC 6405	**M6**	M	Scorpius ***Butterfly***	**4.5**	1,480	4.2	Couldn't quite resolve stars
NGC 2287	**M41**	S	Canis Major	**5**	2,350	4.5	Glare from Sirius is distracting!
IC 4725	**M25**	S	Sagittarius	**5**	2,115	4.6	A magnitude +6.0 star lies 0.7° N.
NGC 7092	**M39**	S	Cygnus	**5**	969	4.6	A magnitude +5.3 star lies 1° W.
NGC 1039	**M34**	S	Perseus/Andromeda	**5.5**	1,650	5.2	
NGC 1981	HT30	S	Orion	**5.5**	--	4.2	Though it's bright, it can take time to spot considering it's the northernmost and faintest of the *four* naked-eye patches that make up **Orion's Sword**.
NGC 2168	**M35**	M	Gemini ***Soccer ball***	**5.5**	2,815	5.1	Has the much fainter (mag. +8.6) and further (14,800 l-y) open cluster **NGC 2158** faintly visible with 7x35s just to its SW.

...continued

Designations[1]		A.V.S.[2]	Constellation/Nickname[3]	Rtg[4]	Distance[5]	Mag[6]	Comments and Visual Notes
NGC 6633	HT92	M	Ophiuchus/Serpens Cauda ***Tweedledum***	**5.5**	1,275	4.6	A magnitude +5.7 star lies 22' SE.
NGC 2548	**M48**	M	Hydra	**6**	2,475	5.8	
IC 4756	HT93	L	Serpens Cauda ***Tweedledee***	**6**	1,535	4.6	Also known as **Melotte 210**; A magnitude +6.4 star lies 15' away on its SE edge; It's an unlikely cluster member though due to it being about 200 l-y more distant.
IC 4665	HT83	M	Ophiuchus ***Hello***	**6.5**	1,125	4.2	Lies high (17°) above the galactic plane; In binoculars the cluster's inner group of bright stars spurs the imagination of many amateur astronomers.
NGC 6611	**M16**	S	Serpens Cauda ***Star Queen***	**6.5**	5,480	6.0	No part of the nebula is visible in binoculars, so naked-eye rating is just of the cluster itself.
NGC 752	C28	M	Andromeda	**7**	1,440	5.7	An old open cluster – maybe 1.7 billion years old.
Stock 23		S	Camelopardalis/Cassiopeia ***Pazmino's***	**7**	1,985	--	Sometimes listed as magnitude +5.6; Discovered in the mid-1950's.
Orion OB1a**		VL	Orion	**~7**	1,305	--	Most noticeable as a very large scattering of stars between Delta (δ) and Gamma (γ) Orionis.
NGC 2099	**M37**	S	Auriga	**7.5**	4,690	5.6	A magnitude +6.2 star lies 30' SW.
Scorpius OB1		L	Scorpius ***False Comet's Tail***	**7.5**	4,990	--	On atlases the core of the **Scorpius OB1 Association** is labeled as **Collinder 316** (mag. +8.6) and/or **Trumpler 24** (mag. +3.4). With the naked-eye, it resembles the wide tail of a comet with **NGC 6231** below it being the head.
NGC 6531	**M21**	S	Sagittarius	**7.5**	3,945	5.9	Lies over 0.5° NE of emission nebula **M20**.
NGC 663	C10	S	Cassiopeia ***Horseshoe***	**8**	9,350	7.1	Has a catalogued visual magnitude noticeably fainter than its true visual magnitude. Very possibly the most distant open cluster visible with the unaided eye in the entire sky.
NGC 1960	**M36**	S	Auriga	**8**	3,775	6.0	
NGC 2281	SD30	S	Auriga	**8**	1,695	5.4	
NGC 6494	**M23**	S	Sagittarius	**8**	2,360	5.5	Outshines the magnitude +6.5 star that lies 20' to its NW.
Kemble 2		S	Draco ***Little Queen***	**8**	--	--	Sometimes listed as magnitude +5.6; Rather prominent group of 7th and 8th-magnitude stars in the shape of a small "W" in binoculars (an asterism).
NGC 6705	**M11**	S	Scutum ***Wild Duck***	**8**	7,160	5.8	The bright surrounding star field adds difficulty; Its distance is one reason it looks so compact.
Stock 2	SD6	L	Cassiopeia/Perseus	**8.5**	1,220	4.4	
NGC 2447	**M93**	S	Puppis	**8.5**	3,270	6.2	
Trumpler 10		S	Vela	**8.5**	1,410	7.0	The O runaway star Zeta (ζ) Puppis (also the nearest O type star to Earth) is believed to have been ejected from this cluster 1.8 million years ago.
NGC 2682	**M67**	S	Cancer	**8.5**	2,800	6.9	A very old open cluster – maybe 4 billion years old.
Trumpler 3		S	Cassiopeia/Camelopardalis	**9**	2,190	5.9	
NGC 1342	SD11	S	Perseus ***Sting Ray***	**9**	2,130	6.7	
NGC 1528	HT25	S	Perseus	**9**	3,340	6.4	
NGC 1647	HT27	S	Taurus	**9**	1,915	6.4	A magnitude +6.0 star lies 20' N.
NGC 1750* (1746) & **1758**	SD17 & SD18	M	Taurus	**9**	2,345 & 2,880	6.1	**NGC 1758**, a more distant cluster in the same line of sight, is included in the rating.
NGC 2301	HT39	S	Monoceros	**9**	2,805	6.0	
NGC 2323	**M50**	S	Monoceros	**9**	3,180	5.9	
NGC 2437	**M46**	M	Puppis	**9**	5,160	6.1	The reason the author can see it with the naked-eye even though it's dim in binoculars is because its angular diameter shrinks when viewed naked-eye.
NGC 2546**	HT46	L	Puppis	**9**	3,065	6.3	Can see two stars on either side
NGC 6124	C75	S	Scorpius	**9**	2,055	5.8	
NGC 6774		M	Sagittarius ***Ruprecht 147***	**9**	995	--	At around 3 billion years old, it is by far the oldest of the nearby open clusters.

...continued

Designations[1]		A.V.S.[2]	Constellation/Nickname[3]	Rtg[4]	Distance[5]	Mag[6]	Comments and Visual Notes
NGC 6940	HT101	M	Vulpecula	**9**	3,340	6.3	Brightest members shine only at 11th-magnitude; Rating includes brighter field stars superimposed on cluster.
Stock 12		S	Cassiopeia	**9**	1,425	--	
Collinder 463	SD5	S	Cassiopeia	**9.5**	2,795	5.7	
NGC 1582		S	Perseus	**9.5**	3,190	7.0	Is the brightest object on the Astronomical League's difficult Herschel II Observing Program.
NGC 1912	**M38**	S	Auriga	**9.5**	3,610	6.4	
NGC 2360	C58	S	Canis Major	**9.5**	3,505	7.2	Best to block Sirius when trying to spot!
NGC 2527		S	Puppis	**9.5**	2,085	6.5	Some maps only plot its core with the designation **NGC 2520**.
NGC 7243	C16	S	Lacerta	**9.5**	2,850	6.4	Very difficult due to the surround star field being so bright!
NGC 6242	HT79	S	Scorpius	**10**	4,160	6.4	
NGC 7654	**M52**	S	Cassiopeia	**10**	5,220	6.9	Bright background makes it a *very* difficult object to detect with the unaided eye.
NGC 7789	HT108	M	Cassiopeia	**10**	6,765	6.7	
↑All together, the author has found over sixty open clusters are visible naked-eye from his observing location where the limiting magnitude at the zenith is +7.5.↑							
NGC 2477	C71	S	Puppis	**0.5**	4,700	5.8	Would be just visible to the author naked-eye if not for the magnitude +4.5 star which lies 20' S.
NGC 6709	HT94	S	Aquila	**0.5**	3,470	6.7	
NGC 6913	**M29^**	S	Cygnus	**0.5**	5,605	6.6	Lies 1.8° S of magnitude +2.3 Gamma (γ) Cygni and right on the edge of the bright **Cygnus Star Cloud**. Would be brighter if not for the large amount of interstellar extinction.
NGC 7209	SD105	S	Lacerta/Cygnus	**0.5**	3,840	7.7	It's visual magnitude is close to one magnitude higher than its listed magnitude. Would be just visible to the author naked-eye if not for the magnitude +6.1 star which lies 15' N.
Kemble 1	HT21	--	Camelopardalis ***Kemble's Cascade***	**2.0**	--	--	Sometimes listed as magnitude +4.0; A less than 3°-long chain of stars – an asterism
↑There are too many open clusters to count that are visible in 7x35 binoculars from the author's observing location where the limiting magnitude at the zenith in them is +10.1.↑							

[1] - NGC *stands for 'New General Catalogue',* IC *stands for 'Index Catalogue',* M *stands for 'Messier',* C *stands for 'Caldwell',* HT *stands for its number in Stephen James O'Meara's* Deep-Sky Companions: Hidden Treasures *book, and* SD *stands for its number in Stephen James O'Meara's* Deep-Sky Companions: The Secret Deep. Collinder *is from the Swedish astronomer Per Arne Collinder's 1931 doctoral dissertation on open star clusters,* Trumpler *is from Robert Trumpler's 1930 paper on open star clusters, and* Melotte *is from the British astronomer Philibert Jacques Melotte's 1915 paper on open star clusters.* Kemble *is from a collection of asterisms that the Canadian amateur Lucian Kemble discovered and* Stock *is from Jürgen Stock's 1954 paper.*

[2] - *Apparent Visual Size naked-eye:* VL = *very large;* L = *large;* M = *medium;* S = *small*

[3] - *A commonly accepted nickname that the author liked or an original one he gave it.*

[4] - *Rated on a 0-10 scale, where* zero *is easiest to see and* ten *is the hardest to see (in its category).*

[5] - *All distances are in light-years and rounded to the nearest multiple of 5 after 1,000 light-years. The ones for the open clusters are from Cantat-Gaudin, T., et al. 2018, A&A, 618, A93 except for* ***Melotte 25*** *and* ***Melotte 111****. The ones for the OB Associations are from Melnik A. & Dambis A. 2017, MNRAS, 472, 3887.*

[6] - *Magnitudes gleaned by Cliff Mygatt from* Uranometria 2000.0 Deep Sky Field Guide (2nd English edition, 2001)*.*

^ *Objects that keen observers, such as O'Meara, have been able to see naked-eye from the Northern Hemisphere. These stand as challenges that very few have bested from the United States (or no further south than latitude 19° N).*

******* ***NGC 1746*** *is presumably the same cluster as* ***NGC 1750****, an original find of Sir William Herschel.*

******** *Author can make out at least one individual star.*

Appendix A

40 Notable Stars[†^] *– brighter than +10.1*

Star	Type[1]	Constellation	Mag[2]	Significant Fact(s)
Canopus*	A9 II	Carina	-0.74	Second brightest star in the night sky, but never gets higher than 1.5° for the author (due to its declination of -52.7°).
Betelgeuse*	M2 Iab	Orion	0.4-1.3	B-V index of +1.85; Very bright orange color; Red supergiant with an irregular period.
Antares*	M1.5 Iab	Scorpius	0.9-1.8	B-V index of +1.83; Very bright orange color; Red supergiant with a 173 day period.
Gamma[2] (γ[2]) Velorum*	O9 I+WC8	Vela	1.75	A spectroscopic binary star that contains the sky's brightest Wolf-Rayet star; Has magnitude +4.1 Gamma[1] (γ[1]) Vel 40" away.
Polaris*	F8 I	Ursa Minor	1.98	Closest star to the north celestial pole (will be at its closest on March 24, 2100 with an apparent separation of 27' 09").
Epsilon (ε) Eridani*	K2 V	Eridanus	3.73	Third closest star visible with the naked-eye and 9th closest star system (10.48 l-y).
Omicron[2] (o[2]) (40 Eri) Eridani A*	K0.5 V	Eridanus	4.43	12th fastest proper motion (4.1" a year) and the ~50th closest star system (16.30 l-y). White dwarf companion visible in 8x56s.
Mu (μ) Cephei*	M2e Ia	Cepheus	3.4-5.1	B-V index of +2.35; Bright orange color; Red supergiant with a semi-regular period; Nicknamed "Herschel's Garnet Star",
P (34 Cyg) Cygni*	B1 Ia[+]	Cygnus	4.82	The brightest "luminous blue variable" (LBV) in the Northern Celestial Hemisphere and at 4,500 l-y away, is one of the most distant stars you can easily see with the naked-eye.
TX (19 Psc) Piscium*	C7,2	Pisces	4.8-5.2	B-V index of +2.78; Strong reddish orange color; Carbon star with an irregular period; One of the few carbon stars that can be followed throughout its entire cycle with the naked-eye.
U Hydrae*	C6.5,3	Hydra	4.6-5.4	B-V index of +2.80; Strong reddish orange color; Carbon star with a 450 day period; One of the few carbon stars that can be followed throughout its entire cycle with the naked-eye.
VV Cephei A*	M2 Iab	Cepheus	4.8-5.4	One of the largest stars known in our Galaxy with a diameter well over 1,000 times that of the Sun.
Y Canum Venaticorum*	C5,4J	Canes Venatici	4.9-5.9	B-V index of +3.40; Strong orange; Carbon star with a 157 day period; One of the few carbon stars that can be followed throughout its entire cycle with the naked-eye; Nicknamed "La Superba" by 19th-century astronomer Angelo Secchi.
UU Aurigae*	C6,3	Auriga	5.1-6.6	B-V index of +3.10; Strong reddish orange color; Carbon star with a 234 day period; One of the first carbon stars discovered.
X Cancri*	C5,4	Cancer	5.7-6.9	B-V index of +3.37; Dim reddish orange color; Carbon star with a 195 day period.
V460 Cygni*	C6,4	Cygnus	5.6-6.5	B-V index of +2.52; Dim reddish orange color; Carbon star with a 180 day period.
Omicron (o) Ceti*	M6e	Cetus	2.0-10.1	B-V index of +1.42; Bright orange color; Prototypical Mira star with a 332 day period. Named "**Mira**" by Johannes Hevelius.
U Antliae	C5,3	Antlia	5.4-6.8	B-V index of +2.88; Strong reddish orange color; Carbon star with a 170 day period.
W Orionis	C5,4	Orion	5.5-6.9	B-V index of +3.81; Strong reddish orange color; Carbon star with a 212 day period.
Groombridge 1830*	G8 Vp	Ursa Major	6.45	3rd fastest proper motion (7.0" a year) and lies 29.7 l-y away. Has the largest proper motion of any naked-eye star.
UX Draconis*	C7,3	Draco	5.9-7.1	B-V index of +2.91; Dim reddish orange color; Carbon star with a 168 day period.
RW Cephei	K2 0-Ia	Cepheus	6.0-7.3	One of the largest stars known in our Galaxy with a diameter well over 1,000 times that of the Sun.
Lacaille 8760	M0 V	Microscopium	6.67	Brightest red dwarf, 20th fastest proper motion (3.5" a year), and 26th closest star system (12.95 l-y).
R Sculptoris	C6,5ea	Sculptor	5.7-8.1	B-V index of +4.40; Dim reddish orange color; Carbon Mira star with a 363 day period.
HD 140283	F9 V	Libra	7.21	Nicknamed the "**Methuselah Star**", this is a metal-poor Galactic Halo star and one of the oldest easily visible in the sky.
Lacaille 9352	M1 V	Piscis Austrinus	7.34	2nd brightest red dwarf, 4th fastest proper motion (6.9" a year), and 10th closest star system (10.72 l-y).
RR Lyrae	A8-F7	Lyra	6.9-8.0	Is the first and brightest star to be discovered in the class of short-period pulsating variable stars named after it. Has a period of 13h 36m and a rapid rise to maximum followed by a gradual fade back to minimum. Is an interloper from the low-metal Galactic halo where they usually reside in globular clusters.
Lalande 21185*	M2 V	Ursa Major	7.46	3rd brightest red dwarf, 4th closest star system (8.29 l-y), and 8th fastest proper motion (4.8" a year).
VY Canis Majoris	M2.5 I	Canis Major	6.5-9.6	One of the largest stars known in our Galaxy with a diameter well over 1,000 times that of the Sun.
AH Scorpii	M4-5 Ia-Iab	Scorpius	6.5-9.6	One of the largest stars known in our Galaxy with a diameter well over 1,000 times that of the Sun.
Groombridge 34 A	M1.5 V	Andromeda	8.09	4th brightest red dwarf, 16th closest star system (11.62 l-y), and ~27th fastest proper motion (2.9" a year). Is a red dwarf double star system with an 11th-magnitude companion 34" away.
W Ursae Majoris	F8 V+F8 V	Ursa Major	7.75-8.5	A contact binary star that several times a day goes from bright to dim (or vice versa) in just two hours.
R Leporis	C7,6e	Lepus	5.5-11.7	B-V index of +4.93; Variable strong reddish orange to red color; Carbon Mira star with a 427 day period.
Lalande 21258	M1 V	Ursa Major	8.77	Also known as **Gliese 412**; 7th brightest red dwarf and 11th fastest proper motion (4.5" a year).

...continued

Star	Type[1]	Constellation	Mag[2]	Significant Fact(s)
Chi (χ) Cygni*	S10,1e	Cygnus	5.2 (+/- 2.0) - 13th	Shows one of the largest variations in apparent magnitude of any pulsating variable star. Takes 13.4 months on average to go from around 5th to 13th-magnitude; Sits along the neck of the Swan about 8° NE of the famous double star **Albireo**.
Gliese 1	M1.5 V	Sculptor	8.54	Also known as **Cordoba 32416**; 5th brightest red dwarf and 5th fastest proper motion (6.0" a year).
HDE 226868	O9 I	Cygnus	8.95	O'Meara's *Secret Deep* object 93; Visible companion to the first black hole (**Cygnus X-1**) to be discovered (1971).
BI Cygni	M4 Iab	Cygnus	8.4-9.9	One of the largest stars known in our Galaxy with a diameter over 1,000 times that of the Sun.
Barnard's Star	M3.5 V	Ophiuchus	9.54	O'Meara's *Hidden Treasures* object 87; Fastest proper motion (10.36" a year) known and 2nd closest star system (5.97 l-y).
RW Tauri	B8 V+K0 IV	Taurus	7.9-11.4	With a visual magnitude drop of +3.50 during its primary eclipse (which happens every 2.77 days), this is the deepest eclipsing binary known. The eclipse takes 9 hours but most of the action takes place in a 3 hour span centered on totality – which itself last for 84 minutes. Lies 1,000 l-y away – which is over 10x farther than **Algol**, the most famous eclipsing binary.

↑All are visible in 7x35 binoculars from the author's observing location where the limiting magnitude at the zenith in them is +10.1.↑

† *Remember that some of the stars (such as **Canopus**) are much more difficult to see than their magnitudes would imply due to how low their maximum altitude can be.*

^ *The spectral type, magnitude range, and B-V index number for all the carbon stars except **U Antliae** is from the section on them by Ron Ostromecki and Richard Huziak in The Royal Astronomical Society of Canada's* Observer's Handbook 2020.

1 *- Spectral classification type under the Morgan-Keenan (MK) system. Note that some of the more complex ones are in question. Carbon-star spectra includes two numbers, such as C5,4. The first indicates decreasing temperature from 0 to 9, while the second indicates the strength of the carbon-related molecules on a scale of 1 to 5. A type C5,4 star has a temperature similar to a normal red giant near type M0, and it has strong C_2 bands.*

2 *- Magnitude or magnitude range of each star.*

******* *Author has seen with just the unaided eye!*

Appendix B

25 Challenging Double Stars† – for the Naked-Eye and 7x35 Binoculars

Star	Separation[1]	Constellation	Mag[2]	Comments and Visual Notes
Zeta^{1,2} (ζ^{1,2}) Scorpii	389”	Scorpius	3.62/4.70	Not in *WDS Catalog*; A bright, wide double with ζ^2 appearing orange and a star 8’ S making it into a triangle. Since ζ^1 is part of the **Scorpius OB1 Association**, it’s one of the most distant stars visible naked-eye at 4,900 l-y.
Alpha^{1,2} (α^{1,2}) Capricorni	381.2”	Capricornus	3.66/4.34	(2012) A bright and wide pair that isn’t hard to find and shouldn’t give you much trouble if you concentrate.
Nu^{1,2} (ν^{1,2}) Coronae Borealis	354.7”	Corona Borealis	5.39/5.58	(2011) Binoculars show it to be made up of two honey colored stars.
Theta^{1,2} (θ^{1,2}) Tauri	347.9”	Taurus	3.41/3.94	(2016) Noticeable if one takes the time to stare at the **Hyades**.
Mu^{1,2} (μ^{1,2}) Scorpii	346.8”	Scorpius	2.97/3.51	(2015) Love finding this double star down the back of Scorpius and splitting it without trouble.
Kappa^{1,2} (κ^{1,2}) Tauri	339.4”	Taurus	4.22/5.29	(2016) Binoculars actually reveal many double stars of similar separation (albeit fainter) lie to its NW.
31 (o^1), 30 Cygni	336.7”	Cygnus	3.93/4.83	(2016) Binoculars reveal a golden primary (**o^1 Cyg**) with a blue companion a good distance away.
Epsilon^{1,2} (ε^{1,2}) Lyrae	209.5”	Lyra	4.77/4.56	(2016) Nicknamed the “Double-Double” because in telescopes each member can be split again (hence integrated magnitudes are listed). Probably the best double star with a separation at or near most people’s naked-eye limit.
↑All can be split naked-eye from the author’s observing location where the limiting magnitude at the zenith is +7.5.↑				
Alpha^{1,2} (α^{1,2}) Librae	231.1”	Libra	2.74/5.19	(2012) Lovely orange primary with a bright companion. Amazingly, a few keener eyed observers than the author have been able to split this pair with just their unaided eyes!
Beta^{1,2} (β^{1,2}) Capricorni	205.4”	Capricornus	3.15/6.08	(2012) Binocular double star with the largest magnitude disparity on this list.
Rho (*ρ*) (5 Oph) Ophiuchi	156.4”, 149.2”	Ophiuchus	5.07/6.81/7.29	(2000) From *A* (+5.07) to *D* (+6.81) it’s 156.4” while from *A* to *C* (+7.29) it’s only 149.2”.
17, 16 Draconis	90.0”	Draco	5.03/5.50	(2017) Since **17 Dra** is a double star unto itself, the integrated magnitude of its two members (+5.38/+6.42) is +5.03. Doable with no bracing but exceptionally easy if binoculars are well braced.
37, 36 Herculis	69.3”	Hercules	5.76/6.92	(2017) So far east in Hercules that to the naked-eye seems to instead be part of Ophiuchus’s “Coffin”.
OΣΣ 123 (HR 5074, 5075)	69.2”	Draco	6.65/7.03	(2017) Not a bright pair, but like **Nu^{1,2} Dra**, its separation is optimum for 7x or 8x binoculars.
Nu^{1,2} (ν^{1,2}) (24, 25 Dra) Draconis	62.1”	Draco	4.87/4.90	(2017) One of the easiest to find but one of the first “tough” ones the author found to split. Has been nicknamed “The Dragon’s Eyes”.
Zeta^{1,2} (ζ^{1,2}) Lyrae	43.7”	Lyra	4.34/5.62	(2018) The intensity and brightness with which its two members shine at makes it harder than you would think.
Nu (ν) (14 Sco) Scorpii	41.4”	Scorpius	4.35/6.60	(2019) Nicknamed the “Southern Double-Double”. The disparity between its members makes this a tough one.
Delta (δ) (27 Cep) Cephei	41.0”	Cepheus	3.5-4.4/6.11	(2018) Very tough due to companion being a dull color and over two full magnitudes dimmer.
16 Cygni	39.9”	Cygnus	6.00/6.23	(2019) This pair of off-white stars is a main guide star to finding the bright planetary nebula **NGC 6826** only 0.5° E.
Σ 747 (HR 1887, 1886)	36.1”	Orion	4.70/5.51	(2019) Splitting this tough double star just adds to the many wonders around the **Orion Nebula** in binoculars.
57 Aquilae	35.7”	Aquila	5.65/6.35	(2019) Tucked in Aquila’s SE corner, the author could just split this pair of similar white stars.
Beta (β) (6 Cyg) Cygni	34.6”	Cygnus	3.19/4.68	(2019) **Albireo**; Probably the most famous colored double star. Eluded me for years because it’s only doable on those rare nights that have the perfect combination of seeing and transparency.
61 Cygni*	31.6”	Cygnus	5.20/6.05	(2018) This amazing orange pair of stars is extremely hard to separate and tends to just look elongated. Truly the hardest pair to split on my entire list even though there are two on it that are closer! 7th fastest proper motion (5.2” a year) and 14th closest star system (11.40 l-y).
Psi^1 (ψ^1) (31 Dra) Draconis	30.1”	Draco	4.60/5.59	(2018) Simply an amazing sight to be able to see both members so close together but without a doubt visible.
Psi^1 (ψ^1) (74 Psc) Piscium	29.2”	Pisces	5.27/5.45	(2018) This is the closest pair of stars the author can split in 7x35 binoculars. Interestingly, its twin white suns are not as hard to split as **61 Cyg**! Finding the right Psi could be more of a problem for some...
↑All can be split in 7x35 binoculars from the author’s observing location where the limiting magnitude at the zenith in them is +10.1.↑				

† *The author has been able to split all the double stars on this list. All the separations and magnitudes, unless otherwise noted, are from the* Washington Double Star Catalog*, with the year last measured in parentheses.*

[1] *- Separation(s), in seconds of arc.*

[2] *- Magnitude of each member visible with the brighter member listed first.*

******* *Of all the double stars on this list,* ***61 Cygni*** *is the only one whose members I’m splitting have had their orbit measured with any accuracy.*

Appendix C

25 Asteroids† – that get brighter than +10.0

Designation	Brightness Range (at opposition)[1]	Average Brightness (at opposition)[2]
(4) Vesta^	5.3 to 6.5	6.0
(1) Ceres^#	6.7 to 7.7	7.2
(7) Iris^	6.7 to 9.5	8.5
(2) Pallas*	6.7 to 9.7	8.6
(3) Juno*	7.5 to 10.2	9.1
(6) Hebe*	7.7 to 10.0	9.1
(18) Melpomene*	7.7 to 10.4	9.4
(15) Eunomia*	7.9 to 9.9	8.9
(8) Flora*	8.0 to 9.8	9.0
(324) Bamberga	8.1 to 12.1	10.9
(9) Metis*	8.2 to 9.7	9.2
(192) Nausikaa	8.2 to 11.3	10.3
(20) Massalia*	8.4 to 10.1	9.4
(27) Euterpe	8.4 to 10.6	9.7
(12) Victoria	8.6 to 11.2	10.2
(29) Amphitrite*	8.7 to 9.6	9.2
(11) Parthenope	8.8 to 10.1	9.6
(5) Astraea	8.8 to 11.1	10.3
(43) Ariadne	8.8 to 11.1	10.3
(89) Julia	8.8 to 11.2	10.3
(39) Laetitia	8.9 to 10.4	9.8
(44) Nysa	8.9 to 10.7	10.0
(19) Fortuna	8.9 to 10.9	10.2
(10) Hygiea*	9.0 to 10.3	9.8
(14) Irene*	9.0 to 10.7	9.9

↑From the author's observing location, the limiting magnitude at the zenith with 7x35 binoculars is +10.1.↑

† *This list is from an August 2015* Astronomy *magazine article written by Vincent S. Foster.*

[1] *- Contrary to what many observers assume, an asteroid does not attain its maximum possible brightness when it reaches opposition at the perihelion of its orbit. Rather, about 60% of asteroids are brightest when opposition comes at the orbit's node closest to the Sun. In other words, it's more important for the asteroid to be near the ecliptic than near perihelion. For the other 40%, peak brightness comes some place between that node and perihelion. The reason is the "opposition effect," which makes any solid object reflect more light to us when it is directly opposite the Sun.*

[2] *- Due to the uneven shape and speedy rotation of many of the asteroids, some can vary in brightness by several tenths of a magnitude over the course of a few hours.*

^ *Author has seen with just the unaided eye!*

***** *Author has seen in his 7x35 binoculars.*

[#] *In 2007 the IAU upgraded* ***Ceres*** *from an asteroid to a "dwarf planet" (they also downgraded* ***Pluto*** *from a planet to a "dwarf planet"), making* ***Vesta*** *technically the largest asteroid.*

Appendix D
Your Notes

Date	Object	Instrument	Seeing & Transparency	Other Notes

Epilogue

You only get to have one introduction into amateur astronomy, so hopefully it's a great one that snowballs into a lasting, lifelong interest. I myself am really happy with how I first started. Little did I know at first, but my Father's advice to just begin with binoculars before a telescope was perfect. I've been hooked ever since because using a pair of small binoculars is just so intuitive and allows you to see well beyond naked-eye – but not enough that you can get lost among all those new stars!

I have to say that the most utterly amazing thing I've discovered, after my first ten years in the hobby, is the hard-fought firsthand knowledge of *just how many* deep-sky objects are bright enough to be visible with only the naked-eye and 7x35 binoculars! I mean, I can't even see 10% of the southern sky and yet I've found there's over three times as many objects visible altogether in 7x35 binoculars as there are Messier objects*. I cut my teeth on this project, so as my skills grew, so did the number of objects I could see. In fact, it wasn't until four years ago that I first sighted M57 in my 7x35 binoculars while in late 2015 my list didn't even quite include 150 objects! As a consequence of my list growing slowly, season by season, which ones were my favorite kept changing. I'd have to say that the few that have never changed, once I discovered them, are ones like Omega Centauri, IC 418, NGC 4449, NGC 7789, and the Pipe Nebula.

Is this project done? It's a simple but tough question, and one I asked myself a lot throughout the making of it. To tell you the truth, I really thought I was done multiple times over the last several years. But then I would get my hands on a new book or read of an object I hadn't known about on the Internet. So I'm wise enough now to say that the answer all depends on how much more *time* I'm willing to invest in it. I'm quitting now only because I'd have to spend an inordinate amount of time just to glean only a few more objects.

That doesn't mean I'm done viewing new objects in binoculars, however! Actually, I started on my next project over three years ago when I bought a new pair of Celestron 8x56 binoculars. It's been exciting to discover objects that are visible in them that most people would consider only telescope objects. If all goes well, I hope to publish that list also with a visual brightness rating system in a couple years. It's all part of my quest to view and share with others which deep-sky objects are truly the brightest visible!

But what if you're now hooked on binoculars like myself and want more to see with them? Well, don't forget to check out the Moon and its craters, lunar occultations and eclipses, planetary conjunctions, the planets Uranus (which I can see with the naked-eye after spotting it with binoculars) and Neptune, Jupiter's four brightest moons (Ganymede, Io, Europa, and Callisto) along with Saturn's moon Titan. You can also monitor variable stars, watch Earth orbiting satellites, and see the occasional bright nova – not to mention the handful of comets that get bright enough for binoculars each year!

I am publishing my project's results not to just awaken others to the brightest deep-sky objects in the sky but to also ask for suggestions to objects I might not even be aware of and missed – though that can't be many! So please feel free to contact me anytime at sn4ark@gmail.com if you have a good suggestion or just want to leave a comment. Otherwise, it is my express wish that you enjoy my book, learn from it, get inspired, and send copies of it to every other astronomer you know (especially beginners!).

*including the open clusters visible in binoculars that I didn't include on my list