

# *The Eldorado Star Party*

## *2024 Telescope Observing Club*

*by Bill Flanagan*  
*Houston Astronomical Society*

### **Purpose and Rules**

Welcome to the Annual ESP Telescope Club! The main purpose of this club is to give you an opportunity to observe some of the showpiece objects of the fall season under the pristine skies of Southwest Texas. We have also included a few items on the observing lists that may challenge you to observe some fainter and more obscure objects that present themselves at their very best under the dark skies of the Eldorado Star Party.

The rules are simple; just observe the required number of objects on the observing list while you are at the Eldorado Star Party to receive a club badge.

### **Cluster Fun!**

The telescope program for ESP 2024, “**Cluster Fun!**”, is a list of 28 objects. This observing list contains 3 asterisms, 14 open clusters, 8 globular clusters, and 3 galaxy clusters. As you observe the objects on the list, enjoy the tour that it takes you on to nearby stars that form asterisms in the sky, to open clusters that lie within our Milky Way galaxy, to globular clusters that live in the halo of the Milky Way, and to remote galaxy clusters that are up to 275 million light years distant. Each of the objects have their own unique characteristics. So, as you observe them, take time to compare the similarities and differences between each of them. Have fun and enjoy your time under the clear, dark skies of the X Bar ranch while you observe these beautiful clusters.

Although there are a few challenging objects on the list, most should be visible in moderate sized telescopes. While you are encouraged to observe all the objects, you need to observe only **24 of the 28** objects on the list to qualify for the ESP Telescope Observing Club badge.

### **Previous ESP Observing Clubs**

Please note that all previous observing programs offered at ESP from 2004 onward are still available. Club badges from these earlier programs (*with the exception of 2009 - Texas Hash*) are also available and will be awarded to anyone completing them at ESP. Check the Eldorado Star Party website at [www.eldoradostarparty.org](http://www.eldoradostarparty.org) to select one (or more!) of these observing lists.

### **Club Badges**

Any size telescope or binocular can be used to complete the observing programs. Again, all observations must be made at the Eldorado Star Party in order to qualify for an ESP observing badge. To receive your badge, please turn in your observations to Bill Flanagan any time during ESP. I will try to be available on the observing fields as well as in the Lodge prior to the meals and talks. If you finish the list on the last night of ESP, or I am not available to give you your badge, just mail a copy of your observations to me at 815 Azalea, Houston, TX 77018, and I will send you your badge.

Good Luck and Good Observing!

## *Cluster Fun!*

Primary ID	Alternate ID	Type	Con	RA 2000	Dec 2000	Mag	Size	Distance	Date	Time
Mini-Coathanger		Ast	UMi	16h29m21s	+80°16'52"	10.0	20.0'			
M 92	NGC 6341	Glob	Her	17h17m07s	+43°08'12"	6.5	14.0'	27,000 ly		
Little Queen		Ast	Dra	18h35m26s	+72°22'44"	7.0	21.0'			
M 56	NGC 6779	Glob	Lyr	19h16m36s	+30°11'06"	8.4	8.8'	33,000 ly		
NGC 6791	Berkeley 46	Open	Lyr	19h20m53s	+37°46'18"	9.5	10.0'	13,000 ly		
NGC 6830	Collinder 406	Open	Vul	19h50m59s	+23°06'00"	8.9	5.0'	5,300 ly		
NGC 6834	Collinder 407	Open	Cyg	19h52m12s	+29°24'30"	9.7	5.0'	10,900 ly		
M 71	NGC 6838	Glob	Sge	19h53m46s	+18°46'42"	8.4	4.0'	13,000 ly		
NGC 6866	Collinder 412	Open	Cyg	20h03m55s	+44°09'30"	9.1	14.0'	3,900 ly		
M 75	NGC 6864	Glob	Sgr	20h06m05s	-21°55'18"	8.6	6.8'	68,000 ly		
Collinder 419	OCL 177	Open	Cyg	20h18m07s	+40°43'55"	5.4	4.0'	3,300 ly		
NGC 6940	Collinder 424	Open	Vul	20h34m26s	+28°17'00"	7.2	25.0'	2,500 ly		
M 73	NGC 6994	Ast	Aqr	20h58m55s	-12°38'00"	8.9	9.0'	2,000 ly		
NGC 7062	Collinder 434	Open	Cyg	21h23m27s	+46°22'42"	8.3	5.0'	4,800 ly		
M 15	NGC 7078	Glob	Peg	21h29m58s	+12°10'00"	6.3	18.0'	35,000 ly		
M 39	NGC 7092	Open	Cyg	21h31m48s	+48°26'00"	5.3	29.0'	1,000 ly		
M 2	NGC 7089	Glob	Aqr	21h33m27s	-00°49'24"	6.6	16.0'	37,000 ly		
Palomar 12		Glob	Cap	21h46m39s	-21°15'06"	11.7	2.9'	64,000 ly		
NGC 7209	Collinder 444	Open	Lac	22h05m07s	+46°29'00"	7.8	14.0'	3,800 ly		
Stephan's Quintet	Hickson 92	GalCl	Peg	22h36m01s	+33°57'57"	12.0	3.2'	290 Mly		
Hickson 93	Arp 99	GalCl	Peg	23h15m24s	+18°58'59"	12.0	9.0'	265 Mly		
Sailboat Cluster	NGC 225	Open	Cas	00h43m39s	+61°46'30"	8.9	12.0'	2,200 ly		
NGC 288		Glob	Sci	00h52m45s	-26°35'00"	8.1	13.0'	29,000 ly		
David's 'D'	Collinder 21	Open	Tri	01h50m12s	+27°04'13"	9.0	10.0'	3,400 ly		
Hickson 16	Arp 318	GalCl	Cet	02h09m33s	-10°09'47"	11.4	6.4'	170 Mly		
NGC 1502	Collinder 45	Open	Cam	04h07m50s	+62°19'54"	4.1	8.0'	3,500 ly		
M 35	NGC 2168	Open	Gem	06h09m00s	+24°21'00"	5.6	25.0'	3,000 ly		
NGC 2158	Collinder 81	Open	Gem	06h07m25s	+24°21'48"	12.1	5.0'	15,290 ly		

## *Cluster Fun! – Observing List Notes*

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**Mini-Coathanger** The first item on the ESP 2024 “*Cluster Fun!*” list is classified as an asterism. Unlike a star cluster, whose members are physically associated (by gravity and motion), an asterism is a group stars that are not physically associated but form a distinctive pattern in the sky. The “Mini-Coathanger” looks like a small faint version of its bigger brother, the “Coathanger”, in the constellation Vulpecula. It is formed with about 9 stars ranging in magnitudes 9-11. The bar of the coat hanger is represented by 5 stars in a straight line, running mostly N-S. A number of additional stars form the hook of the coat hanger on the west side of the bar.

**M 92 (NGC 6341)** Located in the constellation Draco; M 92 is a globular cluster about 27,000 light years distant. In the telescope, it has a somewhat irregular round shape about 15’ in diameter. In moderate sized telescopes it will show lots of resolved stars at powers of 100x or greater. Modern observations of M 92 give an estimate of around 330,000 total stars in the cluster! Visually in the telescope, numerous tentacles appear to radiate from the cluster giving it the appearance of a crab or spider. Like most globular clusters, M 92 is very old. However, M 92 has the distinction of being one of the oldest globular clusters in our galaxy, with an age of 14.2 billion years or very similar to the age of the Universe.

**Little Queen** The “Little Queen” is a small asterism of stars located in the constellation Draco. It is a ‘W’ shaped asterism of 7<sup>th</sup> and 8<sup>th</sup> magnitude stars, about 21’ in size, arranged in a pattern that make it look like a small version of Cassiopeia. Hence the name “Little Queen”.

**M 56 (NGC 6779)** A globular cluster located in the constellation Lyra, about 33,000 light years from us. At low power, M 56 shows as a small round glow, about 12’ in diameter, embedded in the Milky Way. At 300x it shows more structure, with some of the cluster stars resolved, giving the appearance of small grains of sand on a somewhat smooth ball. The estimated mass of M 56 is 230,000 solar masses and its estimated age is 13.7 billion years. M 56 is a former member of a dwarf galaxy that merged with the Milky Way about 10 billion years ago whose remains are called the “Gaia Sausage.” Using data from ESA’s Gaia satellite, a team of international astronomers noticed a sausage like shape in the distribution of some of the Milky Way star velocities when cross plotting their circular motion against their radial motion. Hence the name “Gaia Sausage” was given to the grouping of stars that lie within the “Sausage” seen in this crossplot.

**NGC 6791 (Berkeley 46)** An open cluster located in the constellation Lyra about 13,000 light years distant. In the telescope, NGC 6791 appears as grainy glow of countless stars about 15’ in diameter. Some of the foreground stars give it a 3D effect. NGC 6791 is a bit odd for an open cluster. At 8 billion years, it is the oldest open cluster in the Milky Way but still has a very high population of stars. Typically, open clusters don’t have life spans greater than a few hundred million years before they disperse. Also, the stars NGC 6791 are metal-rich which is contrary to the rule that old star clusters are typically metal-poor.

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**NGC 6830** Located in the constellation Vulpecula about 5,300 light years away, NGC 6830 is a reasonably bright open cluster about 10' in size. It consists of about 20 stars ranging in brightness from magnitude 12 to magnitude 13 and arranged in a zig-zag pattern. Four stars near the center are arranged in a shape of a kite. NGC 6830 is relatively young with an estimated age of 37 million years.

**NGC 6834** Situated about 11,000 light years from us in the constellation Cygnus, NGC 6834 is a relatively young open cluster of about 65 million years. The star population is estimated to be around 260 members. In a moderate size telescope, the cluster appears visually as a nice collection of 50 stars ranging from magnitude 10 to magnitude 13 over a field of around 5'. They are arranged in a manner that makes the cluster look like an arrowhead.

**M 71 (NGC 6838)** A globular cluster located in the constellation Sagitta about 13,000 light years from Earth. Although easy to locate, the dense star field at its location in the Milky Way makes it difficult to detect where the cluster ends. Through the telescope, it appears to be about 6' in size with a somewhat irregular shape and without much central concentration. Higher powers will show numerous resolved cluster stars. Because it does not show the typical central concentration of a globular cluster, M 71 was originally thought to be an open cluster. However, recent photometric and spectroscopic studies have shown that it is a loosely concentrated globular cluster about 10 billion years old with a mass of around 53,000 solar masses.

**NGC 6866** An open cluster in the constellation Cygnus at approximately 3,900 light years from us. The view through the telescope will show lots of Milky Way field stars but the cluster stands out from the background as a 12' patch of magnitude 10 through magnitude 13 stars. The central portion is highlighted with a string of 5 pairs of stars running mostly N-S. The age of NGC 6866 is estimated to be 430 million years.

**M 75 (NGC 6864)** Located in Sagittarius at a distance of 68,000 light years, globular cluster M 75 shows as a round glow about 5' in diameter. It is moderately dim for a Messier object. It shows some core concentration but has a mostly smooth appearance. Higher powers will resolve some of its stars, giving it a grainy appearance. There is a bright magnitude 8 star off to the SE about 16'. Like M 56, M 75 is also a member of the “Gaia Sausage” or the remnants of a dwarf galaxy that merged with the Milky Way some 10 billion years ago.

**Collinder 419** This open cluster is in the constellation Cygnus and is located some 3,300 light years from Earth. Collinder 419 is estimated to be only 7 million years old. A bright, dominant, yellowish, magnitude 5.8, massive O star is in the center of the cluster. It is surrounded by 6 dimmer magnitude 10 to magnitude 12 stars in a circle about 4' in diameter. The bright center star shows some nebulosity around it from the remnants of the material that formed the cluster. At 95x and with a UHC filter, more nebulosity can be detected across the entire field of view giving the background a somewhat mottled appearance.

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**NGC 6940** A big, loose collection of bright magnitude 8–13 stars in the constellation of Vulpecula. This open cluster is located about 2,500 light years from us. With an estimated age of 770 million years, NGC 6940 is a relatively old open cluster which explains why it appears quite scattered. Countless streams, maybe around 50 to 70 stars total, fill the entire 40' field at 95x. It seems best at lower powers. The brightest member appears slightly redder than the other members and is located near the center of the cluster. However, the distance of this star has been measured to be 8,000 light years and therefore is not a true member of the cluster but a distant bright background star. Also, the bright, blueish-white stars that show in the wide field are most likely not true cluster members.

**M 73 (NGC 6994)** M 73 is an asterism of four stars in the constellation Aquarius. The Gaia data release 3 shows the distance to these four stars ranging from 1033 light years to 2270 light years, the brightest member having the largest distance. In the telescope, the four stars form a distinctive triangle about 10' in size. The stars range in brightness from magnitude 10.4 to magnitude 12.

**NGC 7062** An open cluster in Cygnus about 4,800 light years from us. The estimated age of this cluster is 300 to 500 million years. NGC 7062 is moderately compact, about 5' in size. In a 14" telescope it shows about 30 stars ranging from magnitude 10 to magnitude 12. They appear to be arranged in a pattern that is reminiscent of an arrowhead with the arrow pointing east.

**M 15 (NGC 7078)** M 15 is a beautiful, bright globular cluster in Pegasus about 175 light years in size and located some 36,000 light years away from us. M 15 is one of the most densely populated globular clusters known and is the host of an intermediate-mass black hole that has an estimated mass of 4,000 solar masses. Transiting just before astronomical twilight, it is well placed in the early evening sky for observing at ESP 2024. Make sure you spend some time and study this big beautiful globular using different powers. It's nestled in a beautiful star field with a bright magnitude 7 star located about 7' to the NNE of M 15. M 15 is about 10' in diameter and shows countless pinpoints of light. The core is moderately concentrated and seems to be biased slightly to the NNE. Try using a filter to see if you can detect the planetary nebula, Pease 1, that is embedded in M 15 about 25" NE from the center of the cluster. Current estimates give the population of M 15 to be over 100,000 stars and an age of 12 billion years. At magnitude 6.2, M 15 shines bright enough to be visible naked eye under good dark, transparent skies. If sky conditions permit, see if you can detect M 15 naked eye.

**M 39 (NGC 7092)** A big and bright open cluster in Cygnus, M 39 consists of a couple dozen magnitude 6-9 stars arranged in a triangular pattern. It's embedded in the Milky Way, and there appear to be many dark streaks and mottling running through it. With an apparent size of 29', M 39 is about the same size in the sky as a full moon. The distance to M 39 is approximately 1,000 light years and the estimated age is 279 million years.

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**M 2 (NGC 7089)** This globular cluster is located in the constellation Aquarius at an estimated distance of 37,000 light years. It has the distinction of being the first globular cluster added to the Messier catalog. With a diameter of 175 light years, M 2 is one of the largest known globular clusters. Its is 13 billion years old and it contains over 150,000 stars. In the telescope under dark skies, M 2 shows lots of resolved stars. Compared to M 15, M 2 has a smoother distribution of light, and the core is not as concentrated as the core of M 15. Like M 56 and M 75, M 2 is also a member of the “Gaia Sausage” or the remnants of a dwarf galaxy that merged with the Milky Way some 10 billion years ago.

**Palomar 12** A dim globular cluster located in Capricornus about 64,000 light years from Earth. Palomar 12 is one of the challenge objects on this year’s list. It is a young globular cluster with an estimated age of 6 billion years. It is suspected to have been captured from the Sagittarius Dwarf Elliptical Galaxy, a small satellite galaxy of our Milky Way, during a close encounter that happened about 1.7 billion years ago. In moderate size telescopes of around 14” in aperture, Palomar 12 is detectable as an irregular, mottled glow just 2' to the NNE of a small right triangle of magnitude 11 stars. Try the trick of tapping the telescope to wobble it slightly and see if that helps the cluster pop into view from the background glow. Using averted vision, the globular will sometime show a couple of dim stellar objects which are probably foreground stars. Definitely a challenge object for small to moderate telescopes, but on nights with good dark transparent skies, the triangle asterism will make it easier to locate and detect.

**NGC 7209** This open cluster is located in the constellation Lacerta. It is about 3,800 light years from Earth and its age is estimated to be 420 million years. It contains around 150 stars and has a mass equal to 278 solar masses. In a moderate sized telescope, about 30 magnitude 9 to magnitude 12 stars will fill a field of around 20'. Bright HT Lac glows at magnitude 6.1 on the north edge of the cluster. It has a yellow/orange tint to it that contrasts with the white/blueish stars in the cluster.

**Stephan’s Quintet (Hickson 92)** A compact cluster of 5 galaxies located in the constellation Pegasus. Four of the group, NGC 7317, 7318A, 7318B and 7319 are at distances between 210 and 340 million light years. They are gravitational bound, interacting with each other and will probably merge at some point in the future. The fifth galaxy, NGC 7320, is a foreground galaxy about 40 million light years distant. At 186x in a 14” telescope, the group will initially show as four elongated smudges of light in the eyepiece. Three of them form a triangle about 1.5' on each side. NGC 7320 is located on the SE corner of this triangle and is the largest and brightest galaxy in the field. The smudge on the northern tip of this triangle is actually 2 galaxies, NGC 7318A and 7318B. If seeing permits, use high power and averted vision to see if you can detect that this smudge of light is composed of two faint blobs which comprise the pair of galaxies NGC 7318A & 7318B. NGC 7317 is located on the SW corner of the triangle. There is a magnitude 13 star just north of NGC 7317 which tends to make it look like a double. If you follow a line that runs from NGC 7317 through 7318A/B and continue another 1.5' past 7318A/B, with averted vision you should find a small faint

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glow of light. This is NGC 7319 and is probably the hardest member of the galaxy cluster to detect.

**Hickson 93** A compact cluster of 5 galaxies in the constellation Pegasus. Four of these galaxies, NGC 7550, 7549, 7547 and 7553, are about 265 million light years from Earth and appear to be gravitationally bound to each other. The fifth, NGC 7558, is a background galaxy about 400 million light years distant. A moderate size telescope should be able to show the 3 brightest members of the group, NGC 7550, 7549 and 7547. They form a right triangle, the N-S side of which is about 5' long. NGC 7549 is at the northern tip of this triangle and with averted vision it shows as a thin wisp of light, elongated N-S that is just 1.5' east of an 11<sup>th</sup> magnitude star. Large aperture telescopes may show the barred spiral structure of this galaxy. NGC 7550 is 5' to the south of 7549 and is a round glow about 1' in diameter. NGC 7547 is 3.5' to the west of 7550. It is dimmer and elongated about 1' x 0.5' in the E-W direction. The other two members NGC 7553 and NGC 7558 are located to the east of the 3 brighter members. Both are dim, listed near 16<sup>th</sup> magnitude, and are hard to detect in small and moderate sized telescopes.

**Sailboat Cluster (NGC 225)** This is an open cluster in Cassiopeia about 2,200 light years distant. The age of NGC 225 was believed to be around 120 million years. However, recent H $\alpha$  and infrared studies indicate that it is younger than 10 million years. For such a young cluster, NGC 225 is widely dispersed. In the telescope, it shows about 20 bright magnitude 9 -11 stars covering a field of about 15'. The outline formed by the stars of the cluster give the impression of a sailboat with maybe 1 or 2 sails. Although if you ask Will Young, he will tell you that the brighter stars of the cluster look like a "Halloween Cat" with an arched back, tail and two eyes staring forward.

**NGC 288** A globular cluster in the constellation Sculptor located some 29,000 light years from us with an estimated age of 13.5 billion years. Unlike most other globular clusters, NGC 288 has a low concentration of stars that are relatively loosely bound together. With a moderate size telescope, the stars of NGC 288 should be easily resolved. About 12' in size, the cluster appears to have a somewhat triangular shape to it. Also, because it is a loosely bound globular cluster, it does not show much condensation at the center when compared to other globular clusters like M 15.

**David's D (Collinder 21)** This cluster of stars is located in the constellation Triangulum. There is some debate whether this group of stars is a real open cluster or an asterism. Some recent studies of the stars in the cluster show that some of them are at a distance of 1050 parsecs (3,424 ly) and are indeed related and should retain the original open cluster classification. These studies also indicate that there is a second group of stars, all moving together, at about half the distance to the other stars in the cluster. Through the telescope, the cluster shows about a dozen stars shining between magnitudes 8 and 11. They form the shape of a capital D, but you could also claim they look like an umbrella or a parachute.

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**Hickson 16 (Arp 318)** Located in Cetus, Hickson 16 is a neat cluster of 4 galaxies arranged in a fan-like fashion just northeast of a magnitude 10 star that forms the base of the fan. It is composed of NGC 833, 835, 838 and 839. Although this compact group of galaxies is about 170 million light years distant, it is fairly bright and relatively easy to observe in telescopes of moderate aperture.

**NGC 1502 (Collinder 45)** This open cluster is made up of about 60 stars. Located in the constellation Camelopardalis at a distance of 3,500 light years, NGC 1502 is most likely on the outer edge of the Orion arm of our Milky Way. It is a relatively young open cluster with an estimated age of 5 million years. It is positioned in the sky at the south-eastern end of “Kemble’s Cascade”, the binocular asterism in Camelopardalis. Through a telescope, the cluster shows about 45 bright stars arranged in an interesting pattern and occupying a space of about 8 arc minutes. The stars appear to form a pattern of a man standing proudly with 2 bright magnitude 7 stars at the center of the field.

**M 35 (NGC 2168)** A large and bright open cluster in the constellation Gemini. The distance to M 35 is around 3,000 light years and its overall size is 22 light years. It is a richly populated open cluster with more than 100 stars. The age of the cluster is estimated to be around 175 million years. Through the telescope, M 35 is large and bright, about 25' in diameter and composed of numerous stars ranging in magnitude 8–12.

**NGC 2158** Just 27' to the southwest of M 35 is the open cluster NGC 2158. Recent data from ESA’s Gaia satellite gives a distance of 15,290 light years to NGC 2158, which is considerably further away than M 35. The Gaia data also gives an age of 2.4 billion years for NGC 2158 making it considerably older than M 35. NGC 2158 was originally believed to be a globular cluster and when viewed through a telescope you can understand why. Compared to M 35, NGC 2158 is much more condensed and made of countless dimmer stars giving it the appearance of a distant globular cluster.