The Eldorado Star Party
2022 Telescope Observing Club

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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.

Treasures of Eldorado

Back in the 16th and 17th centuries, stories of a secret, hidden place in the New World called Eldorado drove many European adventurers on fruitless expeditions searching for the immense treasure that was supposed to exist in this legendary city. To this day, no one has found the legendary city of Eldorado or any of its treasures. However, anyone who has attended the Eldorado Star Party knows the secret. The treasures of Eldorado are located in the night sky above the X-Bar ranch!

So to celebrate the 20th Annual Eldorado Star Party, the Telescope Observing Club program this year is the **"Treasures of Eldorado."** The program is a list of some of the most beautiful treasures that have been part of the observing programs of the previous 19 Eldorado Star Parties. You only need to observe **24 of the 26** objects on the list to qualify for the ESP Telescope Observing Club badge. Most are bright enough to be easily seen in an 8-inch telescope.

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 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!

Treasures of Eldorado

Primary ID	Alternate ID	Type	Con	RA 2000	Dec 2000	Mag	Size	Distance	Date	Time
Albireo	Beta 1 Cyg	Mstar	Cyg	19h30m43s	+27°57'35"	3.1		390 ly		
Little Gem	NGC 6818	PNe	Sgr	19h43m58s	-14°09'12"	10.0	22"	7,300 ly		
Berkeley 86	OCL 167	Open	Cyg	20h20m24s	+38°42'00"	7.9	6'	3,600 ly		
NGC 6910	Collinder 420	Open	Cyg	20h23m12s	+40°46'42"	7.3	10'	3,700 ly		
Veil Nebula (West)	NGC 6960	Neb	Cyg	20h45m42s	+30°43'00"	7.0	63' x 6'	2,400 ly		
M 72	NGC 6981	Glob	Aqr	20h53m28s	-12°32'12"	9.2	6.6'	68,000 ly		
Saturn Nebula	NGC 7009	PNe	Aqr	21h04m11s	-11°21'48"	8.3	28"	3,200 ly		
The Cheeseburger	NGC 7026	PNe	Cyg	21h06m18s	+47°51'05"	12.0	25"	4,500 ly		
NGC 7027	PN G084.9-03.4	PNe	Cyg	21h07m02s	+42°14'10"	9.6	18"	2,600 ly		
Horseshoe		AST	Cyg	21h08m18s	+47°14'00"	10.0	25'			
M 15	NGC 7078	Glob	Peg	21h29m58s	+12°10'00"	6.3	18'	36,000 ly		
Garnet Star	Mu Cep	DVar	Cep	21h43m30s	+58°46'48"	4.3		3,060 ly		
M 52	NGC 7654	Open	Cas	23h24m48s	+61°35'36"	8.2	15'	4,600 ly		
Blue Snowball	NGC 7662	PNe	And	23h25m54s	+42°32'05"	8.6	17"	4,600 ly		
NGC 157	MCG -2-2-56	Gal	Cet	00h34m47s	-08°23'47"	11.0	4.1' x 2.3'	76 Mly		
Sculptor Galaxy	NGC 253	Gal	Scl	00h47m33s	-25°17'20"	7.9	28' x 5.5'	13 Mly		
ET Cluster	NGC 457	Open	Cas	01h19m35s	+58°17'12"	5.1	20'	7,900 ly		
Pinwheel Galaxy	M 33	Gal	Tri	01h33m51s	+30°39'36"	6.4	62' x 36'	3 Mly		
M 74	NGC 628	Gal	Psc	01h36m42s	+15°47'00"	9.7	9.5' x 8.9'	47 Mly		
Little Dumbbell	M 76	PNe	Per	01h42m20s	+51°34'31"	10.1	2.7'	2,400 ly		
Almach	Gamma 1 And	Bstar	And	02h03m54s	+42°19'46"	2.1		350 ly		
M 77	NGC 1068	Gal	Cet	02h42m41s	-00°00'48"	9.7	6.6' x 5.8'	70 Mly		
NGC 1087	MCG 0-8-9	Gal	Cet	02h46m25s	-00°29'55"	11.5	3.6' x 2.3'	80 Mly		
Uranus*		Planet	Ari	02h58m55s*	+16°34'32"*	5.6	3.7"	18.7 AU		
Pleiades	M 45	Open	Tau	03h47m00s	+24°07'00"	1.5	120'	444 ly		
Orion Nebula	M 42	Neb	Ori	05h35m18s	-05°23'00"	4.0	40' x 20'	1,344 ly		

*Coordinates for Uranus – Night of 10/27/2022

Treasures of Eldorado – Observing List Notes

Albireo The first treasure on the list, Albireo, is in the constellation Cygnus. Albireo is one of the most beautiful double stars in the sky! Located some 390 light years away, the bright amber component shines at magnitude 3.1 and the dimmer blueish component shines at magnitude 5.1. They are separated by 34", making the pair easy to split. The bright component is also a multiple star having one or possibly two companions. The separation of these companions is less the 0.5" making them virtually impossible to detect visually in any size telescope. Try observing Albireo at different powers to see which power gives the most pleasing view.

Little Gem Located in Sagittarius, the Little Gem, or NGC 6818, is a planetary nebula about 7,300 light years distant from us. It shows as a round glow about 20" in diameter with fuzzy edges. It is somewhat dimmer in the center than the edges. No central star was visible in the 14". It is nestled in an asterism of 3 dim stars that form a triangle.

Berkeley 86 An interesting looking assemblage of about 30 stars ranging from magnitude 9 to magnitude 13, Berkeley 86 is an open cluster in the constellation Cygnus about 3,600 light years from Earth. A circular asterism of stars on the western side of the cluster is made up of about 10 stars arranged in a distorted circle about 3' in diameter. About 4 stars stream off from this circle in the northeastern direction. About 3' in length, this string of stars looks like a tail attached to the circle of stars.

NGC 6910 A beautiful field of about 50 stars in the constellation Cygnus, this open cluster is about 3,700 light years away from us. Two bright stars of magnitude 6 and magnitude 7 anchor the cluster. The magnitude 7 star is yellowish. The stars in the cluster appear to form a stick figure with the magnitude 6 star being a foot. About 3' to the southeast of this star is the magnitude 7 star located at the neck of the stick figure. There is some faint nebulosity that gives the stars in the open cluster a dim halo. The whole cluster is about 7' in size. Try using different powers and filters to see if you can enhance the nebulosity associated with this open cluster.

Western Veil Nebula & 52 Cygni Another familiar treasure in the ESP sky is the Veil Nebula. It is a stunning supernova remnant in the constellation Cygnus about 2,400 light years away. The dark skies of the Eldorado Star Party provide an excellent opportunity to study the intricate filaments visible in this cloud of ionized gas and dust. Perhaps we all have observed and admired the western part of the Veil Nebula that is anchored with 52 Cygni, a bright magnitude 4.2 star. But 52 Cygni also has a magnitude 9.5 companion located about 6" away. Use high power to reveal this beautiful double star embedded in the Veil.

M 72 M 72 is a globular cluster in Aquarius about 68,000 light years from Earth. It is somewhat dim and small for a Messier object but it easily shows in smaller telescopes as a dim, nebulous patch of light about 6' in diameter with somewhat irregular edges. Larger scopes will begin to resolve the individual stars of the cluster. Try using different powers to see if you can resolve the stars in this globular cluster.

Saturn Nebula The Saturn Nebula, or NGC 7009, is a planetary nebula in Aquarius about 3,200 light years away from us. At magnitude 8.3, this planetary is fairly bright and should be a relatively easy target in small aperture telescopes. With moderate sizes telescopes, it first appears as a greenish oval glow about 1' x 0.75' in size that is oriented WSW – ENE. There are small extensions or ears on the east and west sides of the nebula. The edges are somewhat fuzzy, and the center appears a little dimmer than the outer portions. The central star shines at magnitude 11.5 but it is hard to observe because of the low contrast between the star and the nebula. If the seeing permits, try high powers to see if you can dig out the central star.

The Cheeseburger Also known as NGC 7026, the Cheeseburger is a planetary nebula in Cygnus about 4,500 light years from Earth. In the eyepiece it looks like a little hamburger just 30" SW of a magnitude 10 star. It's about 20" x 10" in size and oriented in the north-south direction. Use moderate to high power to reveal the dark lane that runs north-south through the nebula and splits it into the two halves of a bun. In the 14" I can easily see the meat but not the cheese. The edges of the bun are somewhat fuzzy. Try using UHC or OIII filters to see if more of the nebulosity can be detected.

NGC 7027 NGC 7027 is another interesting planetary nebula in Cygnus about 2,600 light years from us. It has a rectangular shape that is about 10" x 20" in size and is oriented mostly NW to SE. It appears to be pinched in the middle, looking sort of like a tiny pillow. The NW side of the nebula is brighter and appears to have a knot in it. No central star visible in the 14".

Horseshoe Located in the sky about 5 degrees to the ENE of Deneb in the constellation Cygnus, the Horseshoe is a neat asterism of stars arranged in the shape of a horseshoe about 25' in size. Two bright Mag 7-8 stars are at the two tips of the horseshoe. Look for the U-shape asterism made up stars ranging from 10^{th} to 11^{th} magnitude.

M 15 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. Transiting about 40 minutes after astronomical twilight, it is well placed in the early evening sky for observing at ESP. Make sure you spend some time and study this big beautiful globular using different powers. It's nestled in a beautiful 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 seem if you can detect the planetary nebula, Pease 1, that is embedded in M 15 about 25" NE from the center of the cluster.

Garnet Star Located in the constellation Cepheus, the Garnet Star or Mu Cephei is a ruddy colored gem that is about 3,000 light years from us. Shining at magnitude 4.3, it is easily visible with the naked eye under the dark skies of ESP. See if you can observe it naked eye and compare its color to the nearby stars in the sky. In the telescope it glows with a bright orange color that really stands out from the surrounding background stars. It has two dim companion stars that can be observed in amateur

telescopes. One shines at magnitude 12.3 just 19.5" to the west and the other at magnitude 12.7 about 40" to the northwest of the Garnet star. There is also a dim nebula surrounding the Garnet Star. Try using a nebula filter to see if you can detect this nebulosity.

M 52 A nice rich open cluster in the constellation Cassiopeia. M 52 is located about 4,600 light years from us and contains up to 100 stars of magnitude 10 and dimmer. It has a prominent magnitude 8.3 yellow star embedded in the western side of the cluster. The concentration of stars suggests a rectangular shape, 10' x 8', oriented N-S with numerous chains of stars running throughout the cluster.

Blue Snowball NGC 7662, or the Blue Snowball, is well placed in the sky at ESP. It ranks near the top of planetary nebula in terms of surface brightness so it should be an easy find. Once you have this planetary centered in your eyepiece, try increasing the power until you can detect the mottled surface of this nebula. If the seeing permits using powers above 300x, you should be able to see some of the delicate structure of the Blue Snowball.

NGC 157 A face-on spiral galaxy in Cetus located about 63 million light years from Earth. It shows as a fuzzy oval about 4' x 2' in size, oriented northeast to southwest. The surface is mottled with some structure that looks like distorted spiral arms. A dim little foreground star is visible on the northeast end. Vary power and look carefully to see if you can detect the hooked spiral arm on the southeast side of the galaxy.

Sculptor Galaxy NGC 253 is a big and bright galaxy in the constellation Sculptor. This galaxy will show a lot of detail even in modest aperture telescopes under the dark skies of ESP. Dark lanes are easily visible running the length of the galaxy. Take some time and soak in all the detail visible in the mottled surface of this galaxy some 13 million light years distant!

E.T. Cluster NGC 457 is an interesting open cluster in the constellation Cassiopeia. Located about 7,900 light years from us, it is a moderately rich open cluster of about 80 stars occupying around 20' of the sky. The stars are arranged in an interesting stick figure pattern that resembles E.T. from Steven Spielberg's movie *E.T. the Extra-Terrestrial*. The two brightest stars in the field mark the eyes of E.T. and two long strings of stars bear a resemblance to his long arms. Prior to the release of the movie, amateur astronomers typically identified NGC 457 as the Owl Cluster. Other names have included the Dragonfly Cluster and the Kachina Doll Cluster. Use your imagination and see how many of these patterns you can see in this cluster.

Pinwheel Galaxy The Pinwheel Galaxy, or M 33, is located in the constellation Triangulum and is about 2.9 million light years from us. Spiral arms, globular clusters, and star clouds, that are physically located in M 33, can all be observed with modest amateur telescopes when the sky is dark and transparent. In addition to observing large-scale structures like the spiral arms and the bright nucleus of this galaxy, see if you can observe some of the other objects that call M 33 home. One of the easiest of these objects to observe is the emission nebula, NGC 604, located in one of the spiral arms of M 33. After locating M 33, see if you can track down NGC 604 located about 12' to the NE of the center of the Galaxy. While there, see if you can also track down 3 more NGC objects that are part of the M 33. NGC 595 is an HII region located 4' NW of the core of M 33. NGC 592 is a small knot in one of the spiral arms located 8.5' W of the core and NGC 588 is an emission nebula located 14' W of the core. With a 40' field of view centered on M 33 all four NGC objects will be in the same field of view.

M 74 M 74, or NGC 628, is a face-on spiral galaxy in Pisces around 30 million light years away from us. In the telescope it initially shows as a round glow about 6' in diameter. Averted vision in a 14" scope shows the surface to be mottled with spiral arms arcing out from the east and west sides of the core. The core of M 74 is concentrated and bright but not necessarily stellar.

Little Dumbbell M 76, or the Little Dumbbell, is a planetary nebula in Perseus about 2,400 light years distant from Earth. Transiting around 1 a.m., it will be nice and high in the sky at ESP 2022. It appears in the telescope as a small dumbbell or dog bone shaped glow about 2' x 1' in size and oriented SW - NE. Moderate sized telescopes should show some surface mottling at higher powers. The ends of the dog bone appear brighter than the center and the SW end of the dog bone appears slightly brighter than the NE end. The dumbbell shape of the nebulosity of M 76 makes it look like a smaller version of its bigger brother "The Dumbbell" or M 27.

Almach A very pretty double star in Andromeda with nice color contrast. The distance to Almach is about 350 light years. The brighter, magnitude 2, star shines with a golden yellow color and the dimmer, magnitude 5, star has a blueish white color. The dimmer companion is located 9.5" to the NE of the bright primary.

M 77 Located in the constellation Cetus, the galaxy M 77 lies about 70 million light years distant. In moderate size telescopes, M 77 will appear as a bright round glow about 3' in diameter. The core is condensed and appears stellar at times. A second galaxy, NGC 1055, lies about 27' to the NNW of M 77. It is dimmer and more elongated, running mostly E-W and about 4' × 1' in size. NGC 1055 located just below a magnitude 11 star which makes for an interesting view. A third galaxy, NGC 1072, is also close by, located about 23' NE from M 77. NGC 1072 is considerably smaller and dimmer than both M 77 and NGC 1055 but using an eyepiece that provides a true field of at least 40' you should be able to observe all three galaxies in the same field of view.

NGC 1087 A face on spiral galaxy in Cetus about 80 million light years from us, NGC 1087 shows as a nice, fairly bright, oval glow about 3' x 2' in size, oriented mostly N-S. The surface shows some mottling and not much brightening toward the core. It is framed in an asterism of 7 stars that look like a martini glass with the galaxy being the olive in the glass! Moving the center of the field about 11' to the NE will bring NGC 1090 and NGC 1094 into the same field of view as NGC 1087. NGC 1094 is considerably smaller and placed 20' to the NE of NGC 1087. NGC 1090 is about 15' to the north of NGC 1087.

Uranus The seventh planet from our Sun was named after the Greek god of the sky, Uranus. During ESP 2022, Uranus will be in the constellation Aries. It will be shining at magnitude 5.6 and because it is only 3.7" in diameter it may be challenging to sweep up in the telescope. However, its pale green hue makes it stand out from the background stars, so once you find the field it will be easy to identify. If the seeing is good, use a high-power eyepiece to clearly show its disk. Uranus has four moons, ranging in magnitudes 13.9 to 14.9, that can be observed in telescopes of moderate size. Spend some time and with the aid of a chart or planetarium program see if you can spot the moons, Titania, Oberon, Ariel, and Umbriel. The dark skies of ESP should provide a good opportunity to observe Uranus without any optical aid. So, once you have found Uranus in the telescope, use the finder scope to help guide you to its position in the sky and see if you can observe it naked eye.

Pleiades The Pleiades, or M 45, is a splendid open cluster in Taurus that is big and bright and to the naked eye looks like a miniature dipper. This group of young stars is only about 100 million years old and is located about 444 light years from Earth. At 2 degrees in extent, it may be difficult to observe the entire cluster in a single field of view of the telescope. However, after locating the Pleiades in your telescope spend some time wandering through this beautiful cluster observing all the cluster members and the nebulosity associated with them. Try using a nebula filter to bring out the nebulosity.

Orion Nebula The last object on the list is the Great Orion Nebula or M 42. Located in the constellation Orion, M 42 is about 1,344 light years distant. Yes, you probably have observed it a thousand times before, but give it another look at ESP. Spend time and study it with different powers and filters. You will be amazed at how much more detail can be seen in this bright nebula when you observe it under the dark skies of ESP! If the seeing is good, use high power and focus on the Trapezium cluster and see if you can spot the E and F components which can be observed in telescopes 6" and larger. A real challenge for those of you with large aperture telescopes is to see if you can dig out the G and H components of the Trapezium.