



Stellafane Convention-Observing Olympics: August 1 – 4, 2024

"Open Stellar Clusters and Asterisms"



<u>Cluster</u>	<u>Coordinates J2000</u>	<u>Const</u>	<u>Type</u>	<u>Diam.</u> <u>Arc'</u>	<u>V</u> <u>Mag</u>	<u>No.</u> <u>Stars</u>	<u>Bt*</u> <u>V-m</u>	<u>Distance</u> <u>Lt. Yrs</u>	<u>Trumpler</u> <u>Type</u>
Napoleon's Hat	14 14 54.6m +18 33 00	Boo	Ast	20.2		8	10.0	--	III 1 vp
Ferrero 27	15 57 59.6 +62 32 39	Dra	Ast	1.5'		6	10.7	--	III 2 vp
ESO 587-SC004	17 04 21.9 -19 27 24	Oph	Cl	2.3'		72	11.2	4,127	IV 3 m
NGC 6520/B86	18 03 24.0 -27 53 18	Sgr	Cl	5.0'	7.6	60	9.0	6,500	I 2 r n
Collinder 469	18 16 34.0 -18 18 42	Sgr	Cl	2.6'	9.1	51	10.7	4,564	IV 1 p
Ruprecht 144	18 33 34.0 -11 25 00	Sct	Cl	12.0'	--	358	10.7	5,000	IV 1 p
Kemble 2	18 35 00.0 +72 23 00	Dra	Ast	30.0'		17	7.0	--	III 2 vp
Apriamasvili 1	18 48 06.0 -05 51 00	Sct	Cl	35'	8.9	94	12.6	7,100	IV 1 p
Messier 11	18 51 06.0 -06 16 00	Sct	Cl	13.0'	6.3	2,900	7.8	6,200	I 2 r
Alessi 62	18 55 19.0 +21 36 06	Her	Cl	23.0'		15	9.8	1,780	III 2 m
Berkeley 46	19 20 53.0 +37 46 18	Lyr	Cl	10.0'	9.5	380	15.0	13,000	I 2 r
Skiff J1942+38.6	19 42 24.0 +38 39 00	Cyg	Cl	3.0'		12	11.3	--	II 1 p
Roslund 3	19 58 41.6 +20 30 39	Sge	Cl	5.0'		20	9.9	7,500	IV 1 p
Roslund 4	20 04 45.8 +29 13 44	Vul	Cl	6.0'	10.0	30	9.5	9,450	II 3 m n
IC 4996	20 16 30.0 +37 38 00	Cyg	Cl	7.0'	7.3	65	8.0	5,095	II 3 p n
NGC 6910	20 23 06.0 +40 47 00	Cyg	Cl	7.0'	7.4	50	6.3	5,000	I 3 m n
Messier 29	20 24 00.0 +38 30 06	Cyg	Cl	6.0'	6.6	50	8.5	5,240	II 3 m n
Dolidze 9	20 25 32.8 +41 54 29	Cyg	Ast	7.0'		8	7.1	--	IV 2 p n
Stein 1	20 35 11.2 +46 05 23	Cyg	Ast	1.5'		6	9.5	--	III 1 vp
Berkeley 53	20 55 57.9 +51 04 52	Cyg	Cl	12.0'		393	16.0	10,000	III 2 m
Messier 73	20 58 55.9 -12 38 08	Aqr	Ast	2.8'	8.9	4	11.3	2,500	III 1 vp
Barkhatova 2	21 43 38.0 +51 04 17	Cyg	Cl	5.0'	8.4	21	10.3	--	III 1 p
NGC 7789	23 57 26.6 +56 43 14	Cas	Cl	14.4'	6.7	1,000	10.1	7,000	II 2 r
NGC 188	00 47 30.0 +85 14 30	Cep	Cl	13.0'	8.1	120	11.6	5,500	I 2 r
NGC 457	01 19 33.0 +58 17 24	Cas	Cl	13.0'	6.7	60	5.0	7,925	II 3 r

HEADINGS:

Diameter – Arc Minutes: Approximate size to 25 magnitudes per square arcsecond Isophote

V-Magnitude: Visual Magnitude - Rough values good to 0.5 to 1.0 magnitude.

Bt* V-m: V-magnitude of the Brightest Star in the Cluster

Type: "Ast" – Asterism

"Cl" – Open Cluster

******* Trumpler Type*******

Concentration:

- I. Detached, Strong Concentration
- II. Detached, Slight Concentration
- III. Detached, No Concentration
- IV. Not Detached from star field

Range of Brightness:

- 1. Most Stars of Near Same Brightness
- 2. Medium Range in Brightness
- 3. Bright and Faint Stars in Cluster

No. of Stars:

- vp Very Poor
- p Poor
- m Medium
- r Rich
- Vr Very rich
- n Nebulosity

Source: "*Star Clusters*", Archinal, B., Hynes, S.
"MegaStar", Wilman Bell

Good Luck-

Larry Mitchell – Eileen Myers





Stellafane Convention - Observing Olympics: August 1 – 4, 2024

Handout: "Open Stellar Clusters and Asterisms"



Napoleon's Hat: 14 14 54.6 +18 33 00 Boo

This is a very large (20.2') asterism of stars which are not gravitationally bound and are not travelling through the interstellar medium together. The cluster is loosely structured and consists of only 8 stellar members, with the brightest member having a V magnitude of 9.4. The Gaia spacecraft has proven its asterism classification, as no two stars have the same proper motion. The asterism stands out very nicely from the background and is obvious, even in the finder scope. The cluster is located only 40 arc-minutes to the south of Arcturus, the fourth brightest star in the sky, and is often overlooked when observing the red-giant spectral type K0III star. Arcturus has moved off the main sequence and is older than the Sun at 7.1 billion years and is 1.08 times as

massive.



Ferrero 27: 15 57 59.6 +62 32 39 Dra

This small elongated shaped stellar grouping is officially listed as an asterism, a collection of unrelated non-gravitationally bound stars, moving independently through space. The Gaia satellite monitored only two of the stars, but they are going in different directions. The reddish star to the south has a Vmag. of 11.9 and is moving in a westerly direction, while the bright star located just to the northeast has a Vmag. of 11.7 and is headed toward the south. Although these are the only stars in the cluster whose proper motion has been determined (Gaia), it strongly corroborates the asterism designation. The northernmost star has a Vmag. of 12.8, and is obviously fainter. Simbad does not recognize Ferrero 27 as a heavenly object, yet it stands out visually in telescopes.



ESO 587-SC004: 17 04 21.9 -19 27 24 Oph

This cluster consists of 72 stars packed into a 5.0 arc minute field, with the brightest star at 11.4 V-magnitude. The distance to the cluster is 4,127 light years and for open clusters, it is located relatively far from the plane of the Milky Way Galaxy at a Galactic latitude of -25.4265. The name 'ESO' is from the European Southern Observatory (ESO) Catalogue, based upon observations with the ESO telescopes at La Silla and Paranal observatories. The determination of the mean radial velocity and metallicity of open clusters requires prior knowledge of the member stars. The membership probability of the stars of the cluster's field contribute decisively in determining the distance and age of the objects. It is essential to accurately determine the proper motions of the stellar members in order to determine cluster membership.



NGC 6520/B86: 18 03 24.0 -27 53 18 Sgr

The open cluster NGC6520 and the Dark Nebula, Barnard 86 provide one of the most stunningly beautiful views found anywhere in the universe. The pair are superimposed over millions of stars that are located in the central core of our Milky Way Galaxy, yet the star cluster stands out well from the background, while the Dark Nebula's blackness is enhanced by this background glow. The cluster is only 60 million years old and contains many bright blue-colored hot stars, an indication of youth. The earliest stars in the cluster are type B4 V stars with a mass of 6M_⊙. Barnard 86 is a small dark nebula, also known as a star forming Bok Globule, which was discovered by E.E. Barnard, who described it as a "drop of ink on the luminous sky". The most recent distance analysis derived a distance of 6,500 light years, which places the cluster and nebula on the outer edge of the Scutum-Centaurus spiral arm. The two objects are located at relatively the same distance

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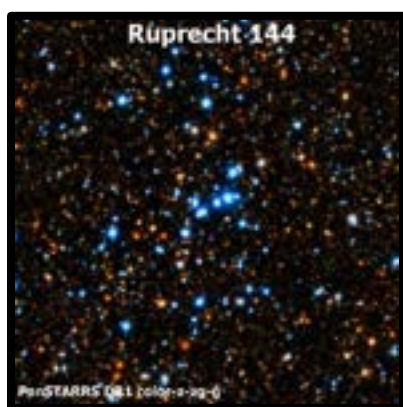
from Earth, however they have very different radial velocities, so B86 could not be the birthing cloud for NGC6520 as has been commonly accepted. Even though they may be near each other now, they certainly were not neighbors when they formed.



Collinder 469: 18 16 34.0 –18 18 42 Sgr

Collinder 469 is a poorly studied open cluster which contains Blue Straggler Stars. These are stars that appear to be older than the typical stellar member of the cluster yet their internal composition appears to be that of a younger star. They are probably the product of a binary collision or possibly a contact binary star which has dredged up materials, indicating a younger star. Cr 469 is a condensation of stars that are located inside the bright open cluster M24. Also located within M24 and near Cr 469 are three Dark nebulae, Barnard 92, 93 and 307. The color photo shows a nice mixture of hot blue stars (Type B & A) and three orange-colored stars, which have left the main sequence. If they are cluster members then the age of the cluster can be estimated, as the turnoff from the main sequence or type B and A stars is only a few tens of millions

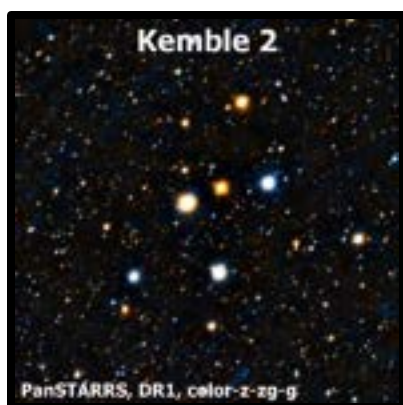
of years.



Ruprecht 144: 18 33 34.0 –11 25 00 Sct

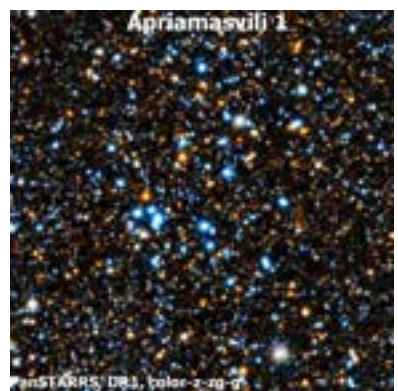
Ru 144 is a moderately young open cluster at 150 million years, and is rather densely populated with a total of 358 stars packed into an area of 12.0 arc minutes. The color photo shows a few brighter members of type B or A stars. Interstellar reddening here is $E(B - V) = 0.32$, so the colors should not be too much affected by intervening material. Ru 144 is located a little over 5,000 light years away and moving predominantly toward the west at a glacial 7.34 milli-arc seconds per year. Ru 144 is located inside the solar circle, and open clusters located toward the Galactic center are important in improving our knowledge of the chemical evolution of the inner Galactic disk. Clusters in this region should suffer enhanced tidal stresses in the form of shocks, and encounters with massive molecular clouds. These processes tend to dynamically heat a star cluster

which produces a cluster expansion on all scales. The resulting loss of gravitational attraction enhances the rate of low-mass star evaporation from the cluster. Consequently, these effects tend to disrupt most clusters, especially the less populous ones.



Kemble 2, "Mini Cassiopeia": 18 35 00.0 +72 23 00 Dra

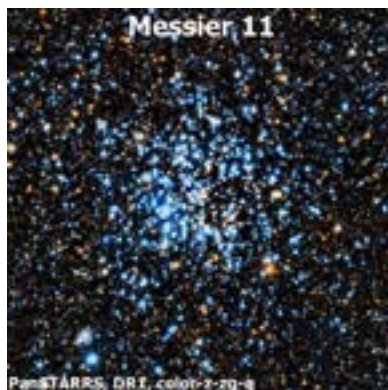
Two asterisms are named after Father Lucian Kemble (1922–1999). Kemble 1 is known as "Kemble's Cascade" and Kemble 2 is an apparent asterism that has come to be known as the "Mini Cassiopeia" due to its likeness to the constellation. There are six stars of 6-8 mag. and a number of fainter ones, which form a very nice asterism. Independently Bruno Alessi, a Brazilian amateur astronomer, also discovered the same asterism on star plots with the Hyper Sky program, and reported it in 1997. Additionally, Philipp Teutsch of the University of Innsbruck, also reported an independent discovery of this group while observing the area visually at 70-power with a Celestron 8" telescope on July 30, 1992. Gaia has confirmed the asterism designation, with the three most easterly stars moving in a general northeast direction, while the others are headed in north and westerly trajectories. An asterism is an apparent stellar pattern created by unrelated stars.



Apriamasvili 1 (Basel 1): 18 48 06.0 – 05 51 00 Sct

Located near the bright cluster M11, Ap 1 in Scutum was discovered by S.P. Apriamasvili in 1964, working out of the Abastumani Observatory in the southeastern part of Georgia. The author's name is "Apriamasvili" however the cluster is listed as "Apriamasvili" in the SIMBAD database. Confusing matters further, some journal papers by the same astronomer are found under the name Apriamashvili. To add even further confusion, the cluster is often incorrectly called Basel 1, a later name bestowed in 1970 which originates from Becker and Fenkart (1971). Apriamasvili 1 is in a 35' x 13' trapezoid formed by four bright stars and is irregularly shaped. Its overall magnitude is

8.9 V-magnitude and its brightest star is 12.6 V-mag. The distance to this cluster is 7,100 light years and it is moving rather rapidly in proper motion to the south in a southeast trajectory.



Messier 11 - The "Wild Duck Cluster": 18 51 06.0 -06 16 00 Sct

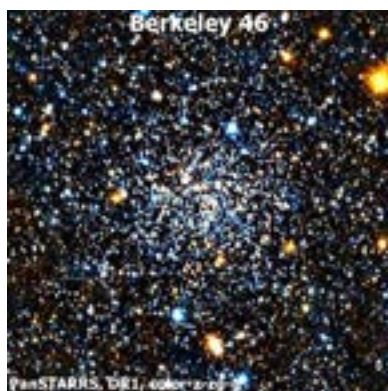
M11 is also known as the Wild Duck Cluster for the roughly V-shaped arrangement of its brightest stars. M11 is located 6,200 light-years from Earth in the constellation Scutum and has an age of about 316 million years. Its apparent V magnitude is 6.3 and of the 26 open clusters included in the Messier catalog, M11 is the most distant that can be seen with the naked eye. M11 is one of the most densely populated open clusters known, and contains over 2,900 stars, with 870 members being of at least magnitude 16.5. The core diameter of M11 is 8.0 light years with a total cluster diameter of a whopping 190 light years. It is one of the few open star clusters in the Messier catalog that has been observed by Hubble. It was discovered by Gottfried Kirch in 1681 and Charles Messier included it in his catalogue of diffuse objects in 1764.



Alessi 62: 18 55 19.0 +21 36 06 Her

A total of 41 asterisms and/or Open clusters have been reported by the Brazilian amateur astronomer Bruno Alessi. 24 of the objects were numbered using truncated J2000 position. Alessi 62 is an optically visible open cluster of bound stars all travelling through space together. This was confirmed by Gaia which showed proper motions in a south-south east trajectory. The orange, westerly star is not a cluster member, as its radial velocity is greater, and its proper motion is in a southwest direction. The cluster is quite bright with the brightest star at only 9.8 V-magnitude. The cluster is composed of a loose grouping of stars, elongated in a northeast – southwest trajectory. The color photograph nicely shows a grouping of blue main sequence stars that are probably Type B or Type A stars, which are much larger and hotter than the Sun. A few yellowish

colored stars could be less massive cooler stars fusing Hydrogen into Helium on the main sequence or they could be massive stars that have left the Main sequence and begun their journey into oblivion. A third possibility is they could be field stars that are unrelated to the open cluster. This is a relatively nearby cluster at a distance of only 1,780 light years.



Berkeley 46 – NGC6791: 19 20 53.0 +37 46 18 Lyr

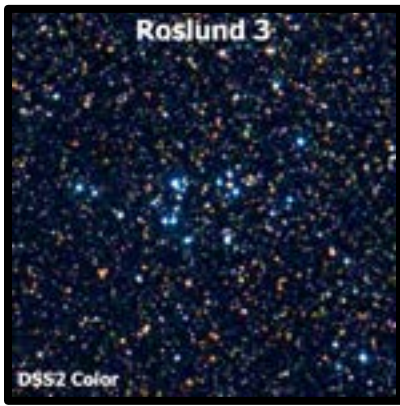
Be 46 is 13,000 light years (4 kpc) away and one of the most populated star clusters, with a mass of several thousand solar masses. It is officially listed as an open Star Cluster however it may in fact be a low mass globular cluster, or a transition object between an OC and a GC. It is very unusual as it is roughly 8 to 10.2 billion years old, yet it has an Iron to Hydrogen metallicity abundance ratio that is more than twice that of the Sun ($[Fe/H] +0.30 \pm 0.5$). It is therefore one of the oldest, yet most metal-rich clusters in the Milky Way. This is contrary to the typical astronomical theory where older normally means less metals, as these heavier than helium elements have not yet had enough time to form. It has an unusually high population of stars and there are three age groupings of stars, which is puzzling and indicative of globular clusters. Due to

Berkeley 46's very highly eccentric orbit, and given its metal and chemical content, it is very possible that Berkeley 46 is the nucleus of a very tidally disrupted galaxy. Berkeley 46 - NGC6791 therefore is a very strange and unusual object.



Skiff J1942+38.6: 19 42 24.0 +38 39 00 Cyg

A total of seven possible Galactic Open clusters have been discovered by Brian Skiff of Lowell Observatory. Skiff discovered this small open cluster visually on June 16, 1988 while observing with his 15 cm refractor from Kitt Peak Observatory. It was noticed while he was star hopping to nearby NGC6819. His observation reads, "Found immediately W of a mag. 7 star. Conspicuous at 50X. 80X/140X: about 10' W of mag 7 star. Cluster outliers to 10' diameter, possibly including many field stars. Concentrated somewhat nebulous (unresolved) core about 3' across with a dozen stars over background, but generally unresolved. 10' area includes about 50 stars mag. 11 and fainter. The cluster has a diameter of about 3' for the main body of the cluster". Philipp



Teutsch independently discovered this group (His Teutsch J1942+3839) during his examination of a POSS print of this area in 1989. The brightest star in the cluster is 11.3 V-magnitude.

Roslund 3: 19 58 41.6 +20 30 39 Sge

Curt Roslund (born 1930) is a Swedish astronomer, who identified 7 clusters, catalogued Roslund 1 to 7 in 1960. Roslund 3 is a sparse largely unstudied open cluster located just below the galactic plane (Gal. Coord, Latitude -04.6818). It consists of a 9.9 magnitude B7 II-III giant star with a mass of approximately 5.1 solar masses, plus a number of fainter late B type stars located on the Main sequence. Ros 3 is 90 million years old, which is similar to the Pleiades, and is 7,500 light years distant which places it at the same distance as the Vulpecula OB1 stellar complex. Its radial

velocity is $-2.6 \pm 1.1 \text{ km.s}^{-1}$ which is also the same as the Vulpecula grouping, also indicating that Ros 3 is part of the OB1 Association. Ros 3 contains about 294 solar masses, mainly composed of late B and A stars within its 32.6 light years tidal radius. The cluster nucleus contains 34 objects, which account for 104 solar masses, plus an additional 19 faint nuclear members which account for another 29 solar masses.



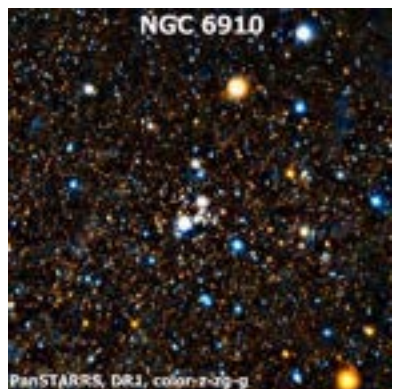
Roslund 4: 20 04 45.8 +29 13 44 Vul

The open cluster Roslund 4 and its associated reflection nebulae IC 4954/55 is a small group of stars with nebulosity, located on the outskirts of the Cygnus Super complex, and is possibly associated with a large CO cloud of around 100,000 solar masses. It is located 9,450 light years away with a young age of 10 million years and a minimum reddening of $E(B - V) = \sim 0.91$. The large amount of molecular gas and the nebula associated with Ros 4 prove this must be a very young object. If so, then there should be present Young Stellar Objects (YSOs), emitting material into the surrounding medium which should result in shocks. Roslund 4 is full of shock excited gas and these regions emit emission lines. Roslund 4 has three active Herbig Haro (HH) candidates, which are small patches of shocked nebulosity that are only found where stars are actively forming. Both reflection nebulae are bright and easily seen visually with the strongest emission coming from the IC4955 area in which an arc is seen. Visually the nebulae are best seen using high powers, without a nebula filter.



IC 4996: 20 16 30.0 + 37 38 00 Cyg

IC 4996 is a very young open cluster located in the Cygnus formation arm and 130 light years above the plane of the Galaxy. Its reddening is a modest 0.673 magnitude and its distance has been listed in various places as 5,646 – 7,817 light years. IC 4996 contains 65 stars within an angular diameter of 12.2 arcminutes on the sky. Four variable stars are known to exist in the cluster and IC 4996 contains many Type-B stars. The age of the cluster has been estimated at a young 7.35 to 10 million years. As further proof of the cluster's youth, there are Pre-Main sequence (PMS) stars still forming within this cluster. They have been identified by Herbig emission line stars of spectral Type AB and T Tauri Stars which cover the spectrum from Type F to K stars. For determining the temperature of Type A to F spectral type stars, the width of the Calcium (Ca) II K line, 3933 \AA is a good indicator. Visually this is a very bright obvious cluster – How did it avoid becoming an NGC object?



NGC 6910: 20 23 06.0 +40 47 00 Cyg

NGC6910 may be physically related to the IC 1318 nebula, also known as the Gamma Cygni Nebula, due to its closeness to the bright 2.2 magnitude foreground star Gamma Cygni, also known as Sadr. The cluster and nebula lie at a similar distance, 2,586 to 5,550 light years, which places NGC 6910 behind the Galactic Great Rift. Because NGC 6910 lies behind a number of molecular clouds, its light is dimmed by more than one magnitude. At a young age of 4.5 million years, a total of 11 pre-main sequence stars (PMS) have been located from late spectral type A to G. A total of 9 variable stars have been detected within NGC 6910, most of which are Beta Cepheid type stars. NGC 6910 shows a mass segregation toward the central region, and warm dust located here

indicates the impact that massive stars have had within the central region. Radio continuum clumps are powered by massive B-type stars with an age range of only approximately 70,000 to 120,000 years. These are located away from the center of the cluster, and massive stars have triggered the birth of these young massive B type stars.



Messier 29 - NGC6913: 20 24 00.0 +38 30 06 Cyg

M29 is a small, bright young open cluster located 1.7 degrees just south of the central bright star Gamma Cygni (Sadr) of Cygnus. Data from Gaia EDR3 gives a parallactic distance of 5,240 light years. Past estimates vary widely due to the light extinction from faint surrounding nebulosity and other foreground interstellar matter of this cross-section of the spiral arms and its location in the Great Cygnus Rift. M29 is included in the Cygnus OB1 association, and the radial velocity component of three-dimensional motion, by default factoring in the solar system's current trajectory, indicate it is approaching at 17 miles/s. Its age is estimated at only 10 million years, as its five hottest stars are all giants of spectral class B0. The linear diameter is estimated at only 11 light years and the four brightest stars form a quadrilateral, and another set form a small triangle just north of the northernmost of the four.



Dolidze 9: 20 25 32.8 +41 54 29 Cyg

Gaia has determined this is an asterism, meaning the stars are at different distances, are not gravitationally bound, and all are moving with different proper motions. Do 9 object has been called the "The Pistol", with the five brightest stars resembling a pistol or a lopsided "T". Determining the composition of the stars and their proper motions will tell if an object is an asterism or a true Open cluster. The "asterism-like" stars comprising the Pistol contain the brightest star in the group (to the west) which is a hot spectral type A2 star at a V-magnitude of 7.11. The star to the immediate east of it has a V-mag. of 10.47 and to the northeast of this star is the trigger of the pistol shining at a V-magnitude of 10.64. To the southwest of this star is a star of V-mag. 9.59 and to the southeast of this is the final star at V-mag. 8.80. Therefore, all of the main stars in this

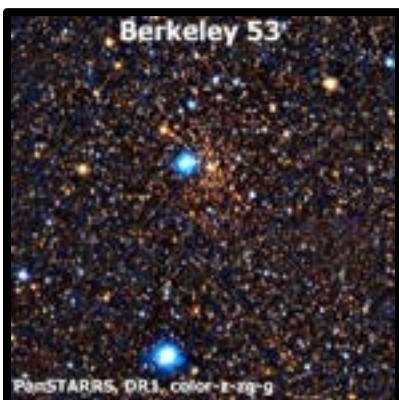
asterism are very bright and obvious. SIMBAD has in the past has incorrectly listed this object as an open cluster. Gaia has proven the asterism designation as no two stars are moving in the same direction and the brightest star is a foreground object.



Stein 1: 20 35 11.2 +46 05 23 Cyg

Stein 1 was discovered visually in a 25 cm telescope on October 14, 2001 and reported by M. Steine of Oslo, Norway in 2001. The Gaia spacecraft has determined this is an asterism, a small group of gravitationally unbound objects that lie at different distances, and are moving independently. The proper motion of the northern member is to the southwest, and is a foreground member, while the southern star moves toward the east. The east and western members both move in a general south-south west direction, proving these four brightest stars are moving independent of each other. The color photo also shows stars of various evolutionary time periods, but this is not necessarily proof of a gravitationally bound or unbound system. The southern brightest star is receding from Earth while the other three members are approaching. The

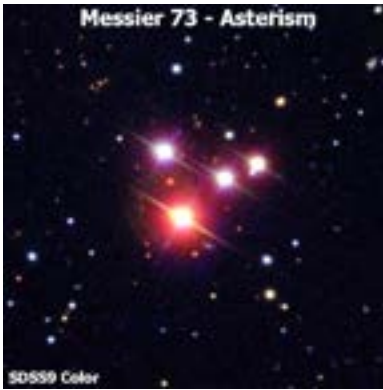
asterism Stein 1 is located within one of the largest asterisms in the night sky, the entire constellation of Cygnus.



Berkeley 53: 20 55 57.9 +51 04 52 Cyg

Be 53 was discovered in 1960 and Ruprecht (1966) classified it as a poor, concentrated open cluster of Trumpler type II 3 p. In 2002, the cluster's apparent diameter was determined at 12' and the Trumpler type is now III 2 m. Berkeley 53 consists of stars fainter than V = 18 mag. with the brightest star in the cluster at 16.0 V-magnitude. The cluster center is located only 3.1' from the bright (V = 6.6 mag) foreground star HD 199578m, which makes photometric observations of the cluster difficult. A rich main sequence is clearly visible, and the estimated number of observed cluster stars is widely varied with high values of ~1000 detected, but the official number of stars in

the cluster is now 393. Berkeley 53 is now considered a rich and massive open cluster belonging to the Perseus Arm and its age exceeds 1 billion years. Be 53 is located at a relatively distant 10,000 light years from the Sun.



Messier 73 – NGC 6994 20 58 55.9 -12 38 08 Aqr

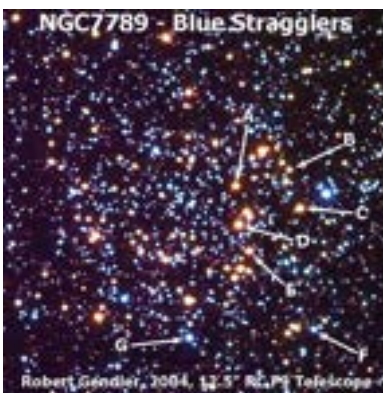
Messier 73 is an asterism of four stars and according to Gaia EDR3, the stars are 1,030, 1,249, 2,170, and 2,290 light-years from the Sun, with the second being a binary star. While the proper motions of the stars are somewhat similar, the different radial velocities prove this is a true asterism of physically unrelated stars. Therefore, the four stars that form the Y-shaped asterism only appear close to each other in the sky because they are located along the same line of sight when seen from Earth. The stars have apparent magnitudes of 10.48, 11.32, 11.90 and 11.94 and M73 was previously thought to be a poorly populated open star cluster which was believed to be bound by gravitational attraction. Charles Messier discovered M73 on October 4, 1780 and described it as a cluster with some nebulosity.



Barkhatova 2: 21 43 38.0 +51 04 17 Cyg

The original discovery was in 1958 by K.A. Barkhatova who plotted the cluster's stars and provided magnitudes. Only two Open clusters bear the name Barkhatova or "Bar" as it is often abbreviated. This cluster was later located on the DSS and the position given by Barkhatova was substantially off at (2000.0) 21 44.3 + 51 12.1, while the position from the DSS was measured at (2000.0) 21 43 32.8 + 51 03 56 for a centrally located star in a cluster diameter of 5.2'. Barkhatova's position was too far east by 45 seconds in RA and north by 8.2' in dec. The number of stars was originally estimated to be 21, and of these 21 stars, 13 are in the GSC. The total photo-visual and photographic magnitudes derived from Barkhatova's measurements are 8.4 and 9.3 respectively. The magnitude of the brightest star according to Barkhatova is 10.0

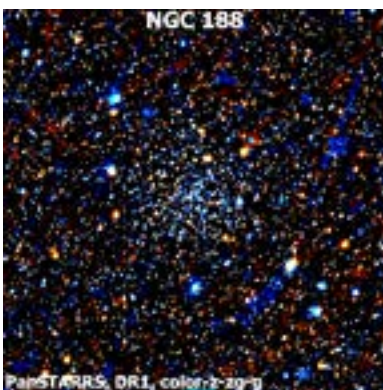
photo-visual as opposed to 10.3 from the GSC. Barkhatova's poor data is often repeated in later references. The color photograph shows a grouping of young hot stellar members, indicating this is a relatively young open cluster, and visually the clusters appears "arrow head shaped".



NGC 7789 – "Caroline's Rose": 23 57 26.6 +56 43 14 Cas

NGC 7789 is an open cluster in Cassiopeia that was discovered by astronomer and comet-hunter Caroline Herschel in 1783. It has become known as "The White Rose Cluster" or "Caroline's Rose" because, when seen visually, the loops of stars and dark lanes look like the swirling pattern of rose petals as seen from above. NGC 7789 is about 6,000 to 8,000 light years away giving this cluster a true diameter of 50 light-years. NGC 7789 is an older open star cluster, at about 1.6 billion years and has a Vmagnitude of 6.7 and an angular size of 14.4 arcminutes. The cluster sits amidst many stars of the Milky Way Galaxy, although the compact nature of this open cluster makes it easy to identify. The approximately 1,000 stars that may belong to the star cluster vary in brightness from 11 to 18 magnitudes. All the stars together are about 3,000

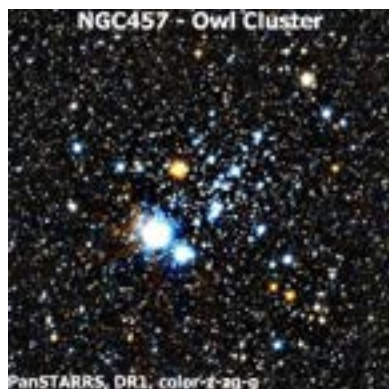
times brighter than the Sun, and a collection of bright Blue Straggler stars are present (See Photo).



NGC 188: 00 47 30.0 +85 14 30 Cep

This open cluster is one of the most studied and written about objects in the heavens. NGC188 is one of the older open clusters with derived ages of 4.5 to 7.0 billion years. There are only about 50 known open clusters older than 1 billion years, which means only about 3% of the known open clusters have ages in excess of one billion years. Modern analysis has zeroed in on an approximate age of 7 ± 0.5 billion years and a distance of about 5,500 light years (1,700 pc). NGC 188 is a massive open cluster which contains a large population of binary stars. Within NGC188 ~50% of the main sequence stars that are within 0.2 magnitudes of the main sequence are single stars, meaning the remainder of stars are actually multiple systems. NGC 188 is a treasure

trove of objects in which to study and understand the make-up of open star clusters. It contains a distinct population of subgiants, red giants (55), blue stragglers (at least 35) and white dwarfs (28).



NGC 457– “Owl Cluster”– “ET Cluster”: 01 19 33.0 +58 17 24 Cas

The cluster lies over 7,900 light years away from the Sun and has an estimated age of 21 million years. The Owl Cluster name is derived from two bright stars Phi Cassiopeiae (magnitude 5.0 and spectral type F0) and HD 7902 (magnitude 7.0 and spectral type B5Ia) which can be imagined as eyes. Gaia has proven (Radial Velocity & Proper Motion) that both bright stars are actual members of the overall cluster, indicating that Phi Cassiopeiae is one of the brightest stars known, surpassing Rigel in luminosity. For comparison, the Sun at the same distance as Phi Cassiopeiae would shine at just 17.3 magnitude. The next brightest star is the red supergiant variable star V466 Cassiopeiae seen in the color photograph. The cluster features a rich field of about 150 stars of magnitude 9-13 and about 60 stars have been identified as true members of the cluster.

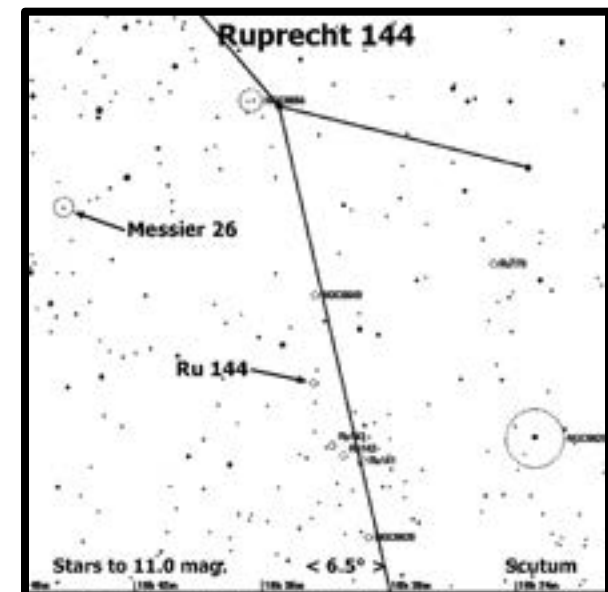
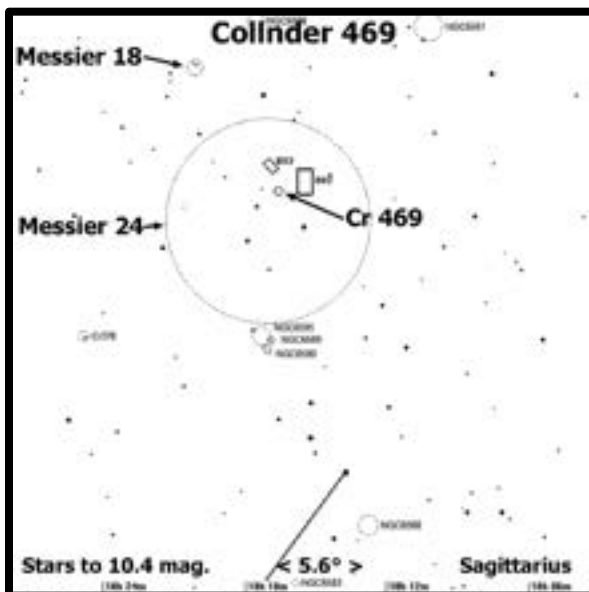
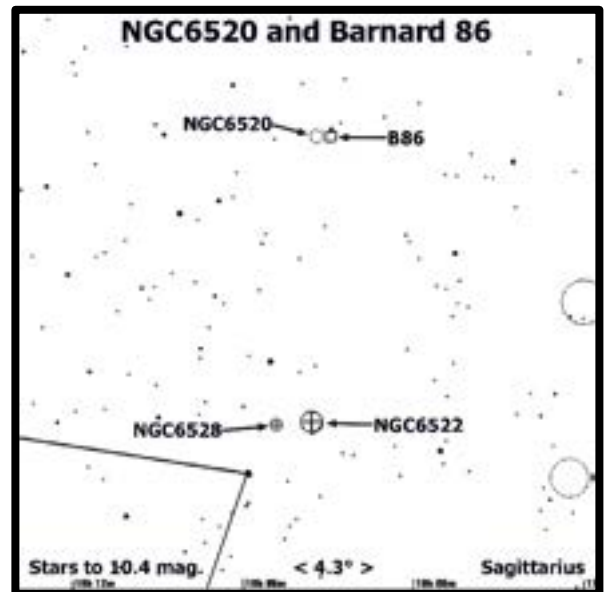
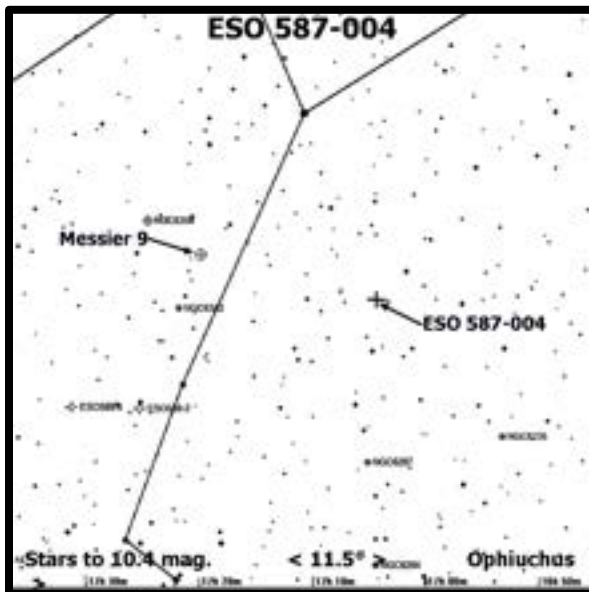
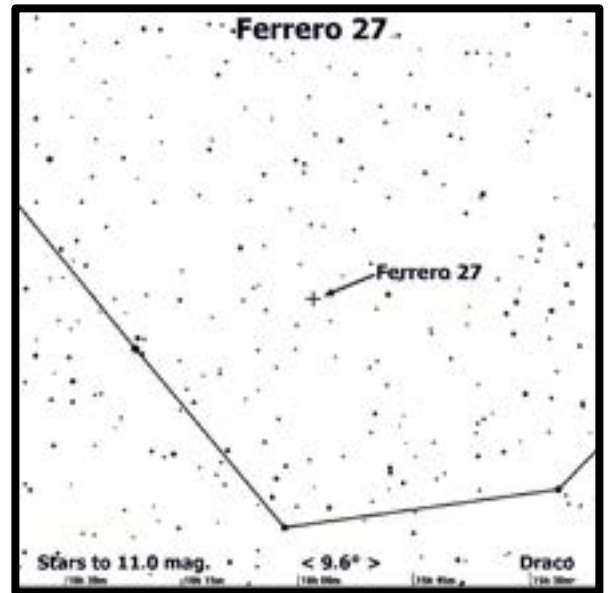
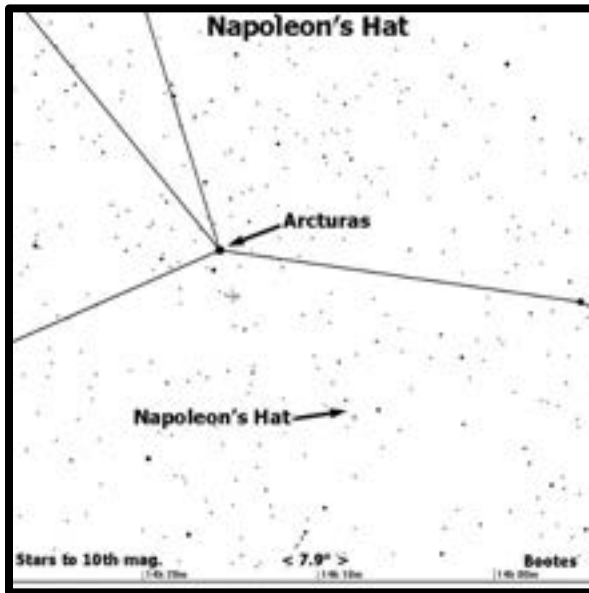
NGC 457 is located within the Perseus spiral arm, but is not associated with any rich star forming field. It is located approximately 7,925 light years away and its age has been determined to be 15.8 to 24.0 million years. The cluster is moderately and uniformly reddened $(B-V) = 0.5$ mag and its overall metallicity is lower than solar.

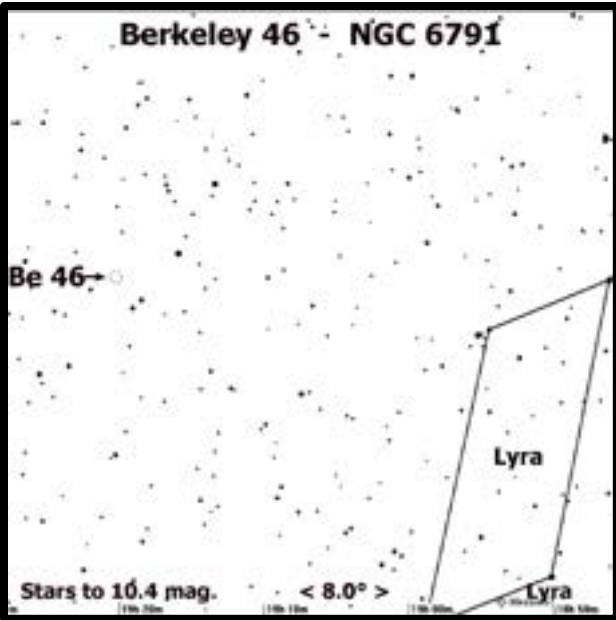
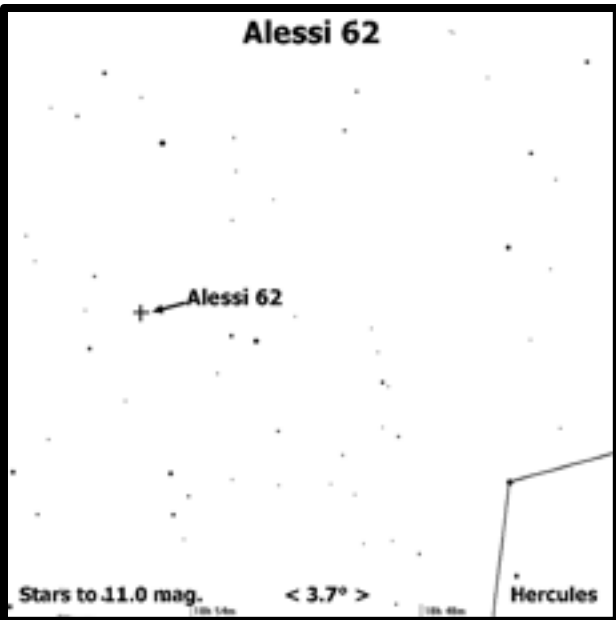
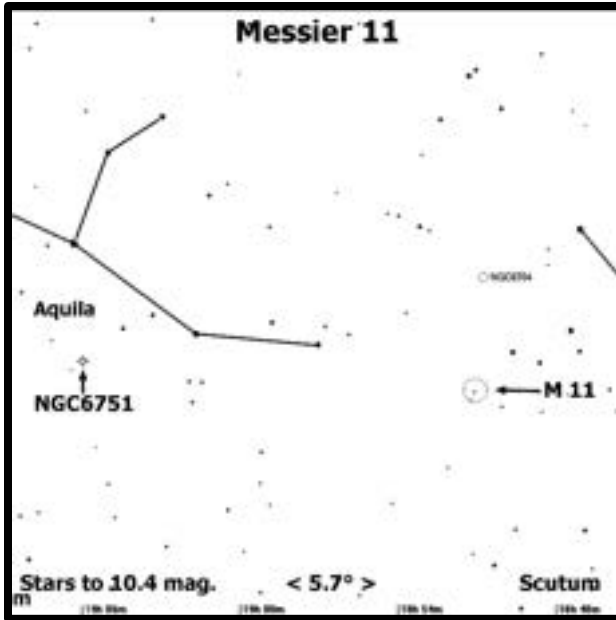
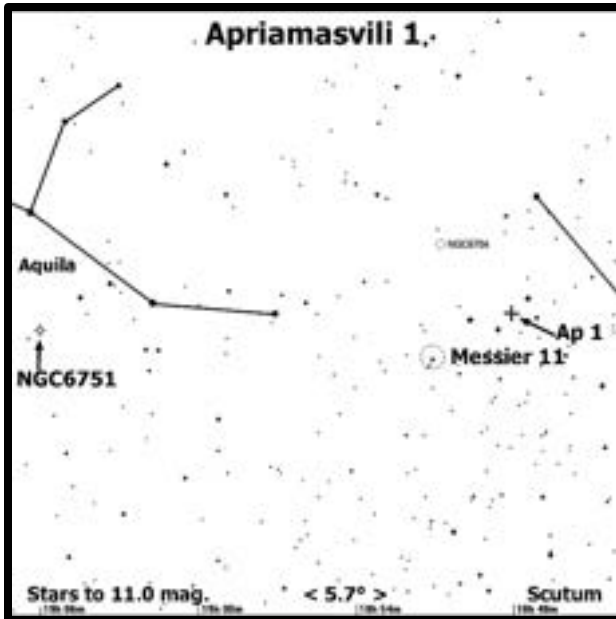
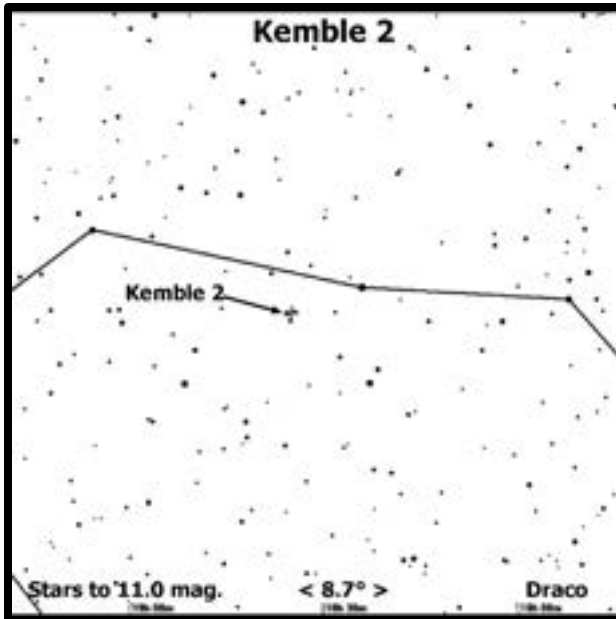
Good Luck - Clear and Steady Skies,

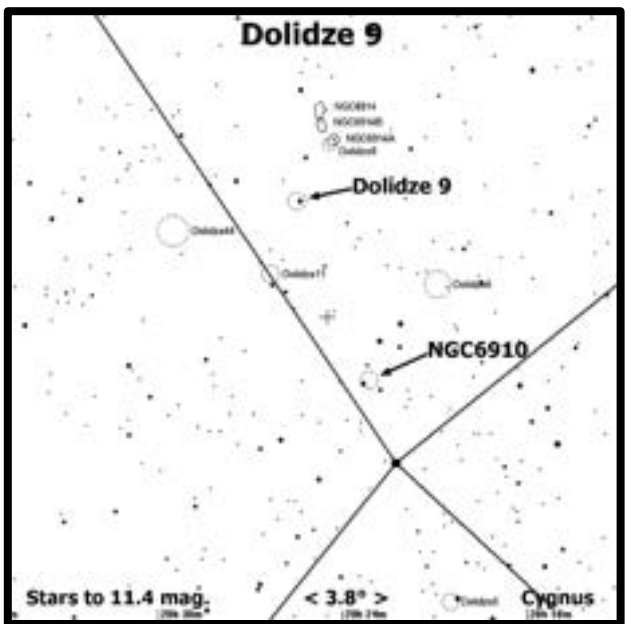
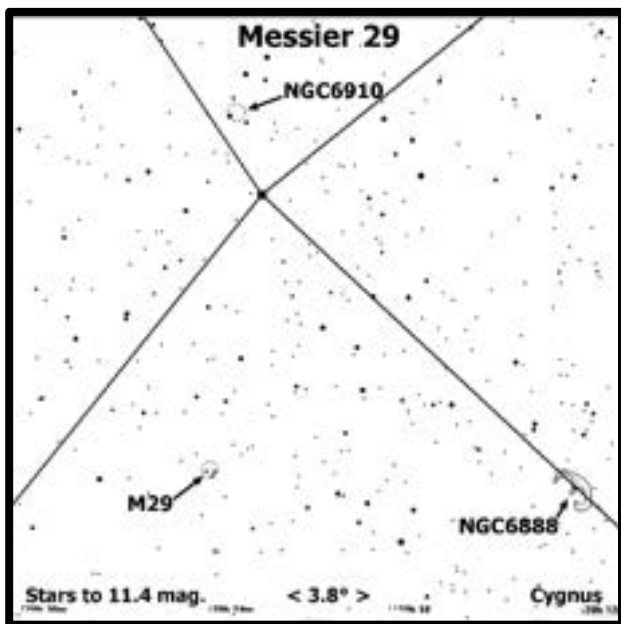
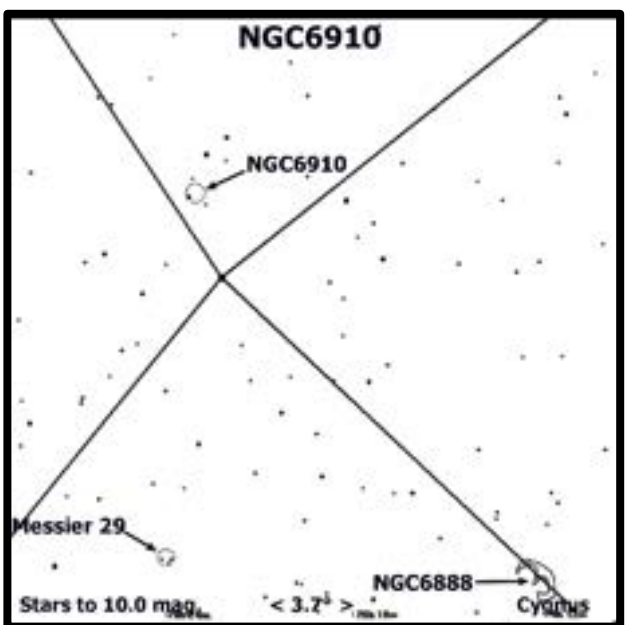
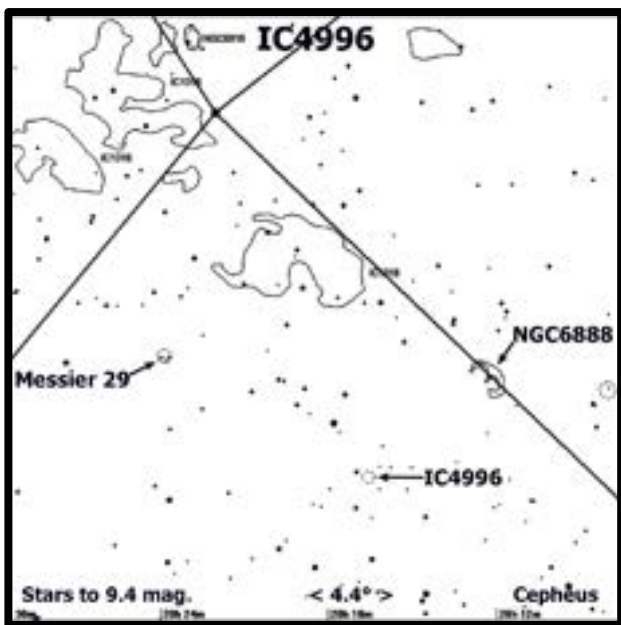
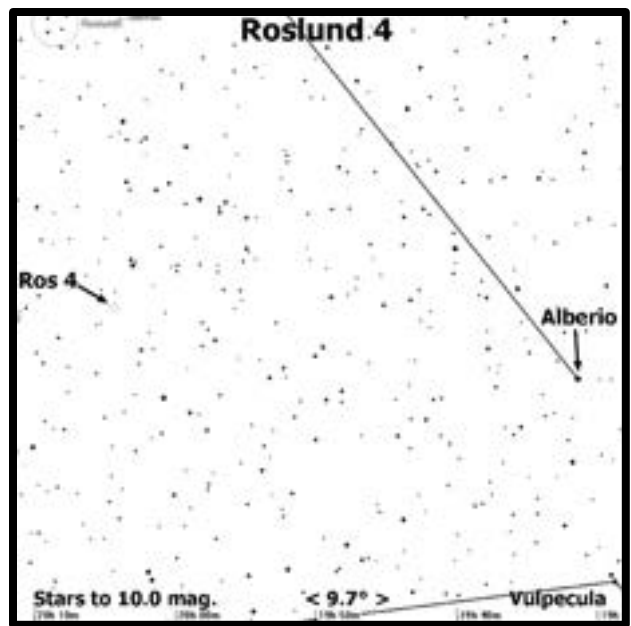
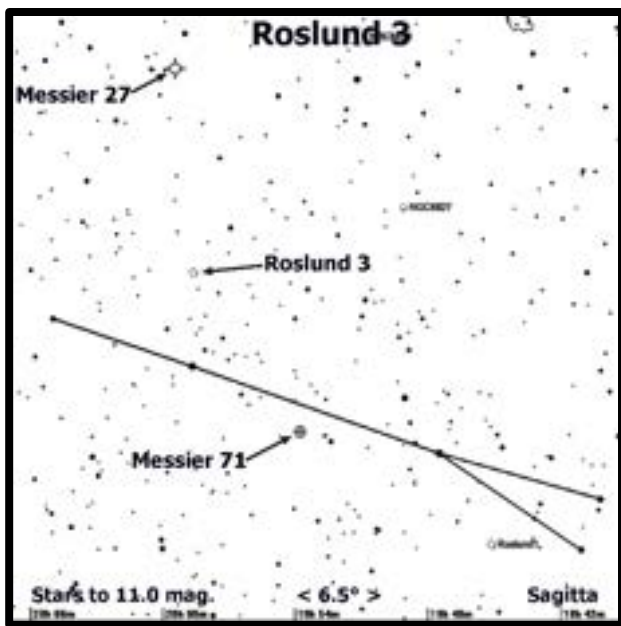
Larry Mitchell - Eileen Myers

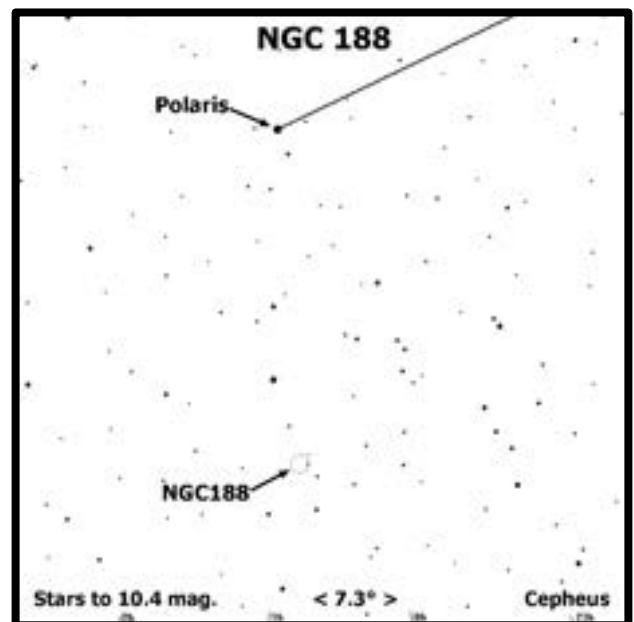
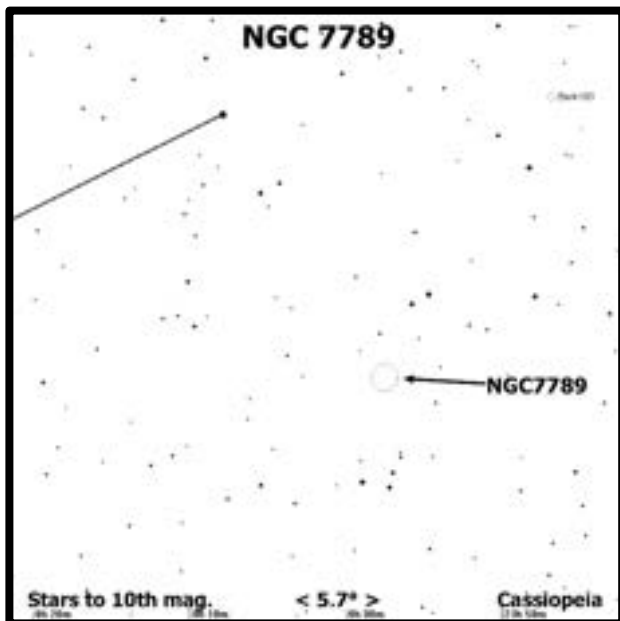
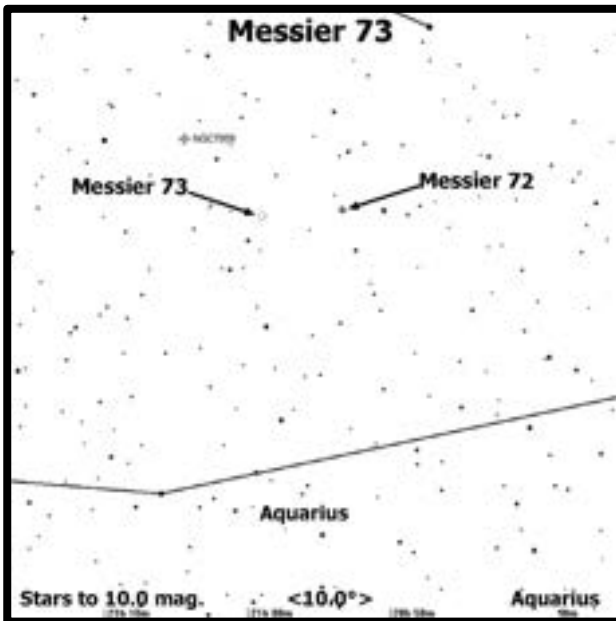
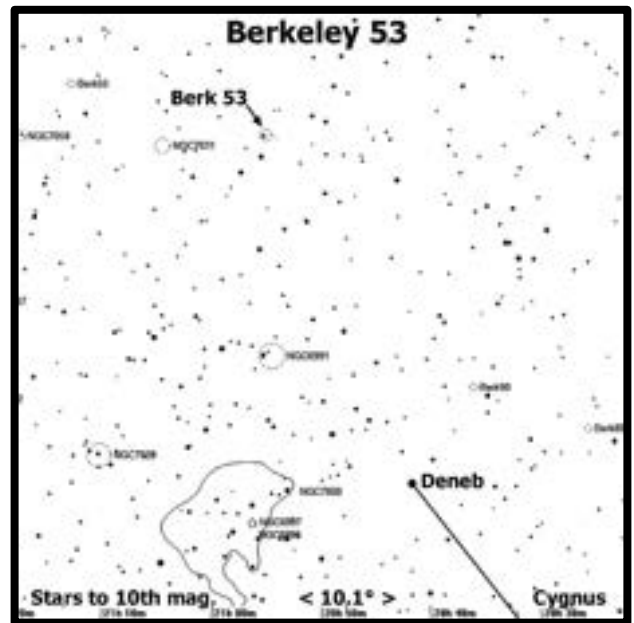
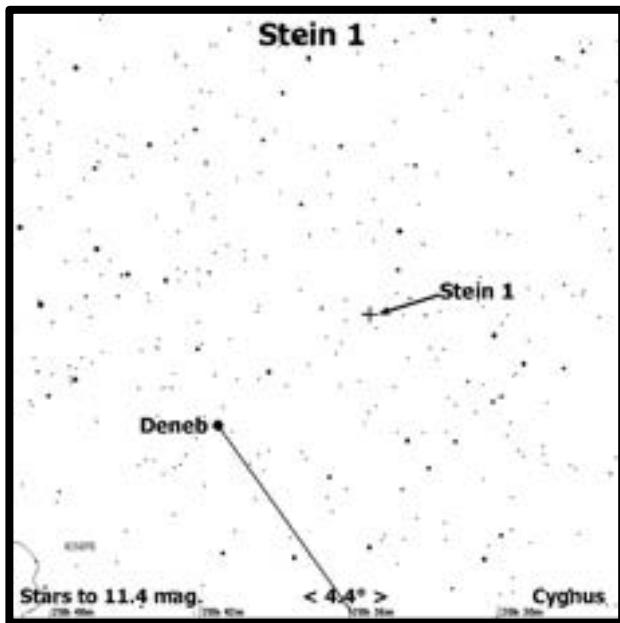


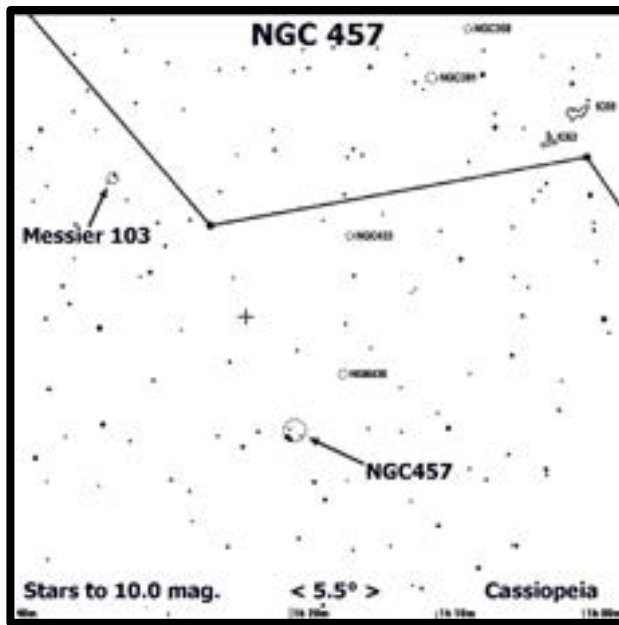
Stellafane Observing Olympics – Open Clusters and Asterisms FINDER CHARTS











Follow the Trail of Stars - Starhop and be Educated.
All Objects should be Visible in 8 - 15-inch Telescopes.

Good Luck - Clear and Steady Skies

Larry Mitchell - Eileen Myers

