Stellafane Observing Olympics - 2026

10th Anniversary

Stellafane - Main Observing Field - July 25, 2025

Larry Mitchell - Eileen Myers

STELLAFANE OBSERVING OLYMPICS – 2026

10th Anniversary - A few of the Best of the Olympic Years

Anniversary Olympics Pins are Awarded for Observations of 15 Objects

Name (s)	Coordinates-J2000)	Const	Type	Mag.	Size	Distance	Year
Mrk 205, PGC39975	12 21 44.4 +75 18 39	Dra	QSO	15.24(V)	Stellar	16.976 GLyrs	2025
NGC 5907, "Splinter Galaxy"	15 15 53.9 +56 19 38	Dra	Gal.	11.1(V)	12.9' x 1.3'	46.6 MLyrs	2015, 16
Ferrero 27	15 57 59.6 +62 32 39	Dra	Ast	--	1.5'	--	2024
Seyfert's Sextet, NGC6027	15 59 11.1 +20 45 17	Ser	Gal C	14.8(B)	2.1' x 1.2'	150 MLyrs	2020
NGC 6210, The "Turtle"	16 44 29.7 +23 47 58	Her	P.N.	11.7(V))	30.0"	6,500 Lyrs	2015, 16, 23
Messier 10, NGC6254	16 57 09.1 -04 06 01	Oph	G.C.	4.98(V)	20.0'	14,300 Lyrs	2022
Messier 92, NGC6341	17 17 07.3 +43 08 11	Her	G.C.	6.52(V)	14.0'	26,700 Lyrs	2022
NGC6369, "Little Ghost Nebula"	17 29 20.5 –23 45 34	Oph	P.N.	12.0(V)	37.0"	>2,000 Lyrs	2023
Hubble 4, PK 3+2.1	17 41 52.8 –24 42 08	Oph	P.N.	13.1(P)	6.0"	8,300 Lyrs	2023
NGC6543, "Cat's Eye Nebula"	17 58 33.5 +66 37 59	Dra	P.N.	11.3(V)	20.0"	3,300 Lyrs	2016
NGC6520 and	18 03 24.9 –27 53 10	Sgr	O.C	7.6(V)	6.0'	6,500 Lyrs	2016, 19
Barnard 86	18 02 58.6 –27 52 00	Sgr	D.N.	--	--	6,500 Lyrs	2016, 19
Kemble 2	18 35 00.0 +72 23 00	Dra	Ast	--	30.0'	--	2024
Messier 11, "Wild Duck Cluster"	18 51 06.0 -06 16 00	Sct	O.C.	5.8(V)	13.0'	6,200 Lyrs	2024, 25
NGC6781, "Snowglobe Nebula"	19 18 28.2 +06 32 15	Aql	P.N.	11.8(P)	1.8'	1,500 Lyrs	2015, 16, 23
NGC6791, Berkeley 46	19 20 53.7 +37 46 18	Lyr	O.C.	9.5(V)	10.0' x 10.0'	15,000 Lyrs	2018, 19, 24
NGC 6826, "Blinking Planetary"	19 44 48.2 +50 31 31	Cyg	P.N.	9.36(V))	38.0"	3,590 Lyrs	2015, 22
NGC6888, "Crescent Nebula"	20 12 01.0 +38 23 00	Cyg	Neb	7.50(V)	18.0' x 8.0'	5,000 Lyrs	2018
NGC6905, "Blue Flash Nebula"	20 22 23.0 +20 06 16	Del	P.N.	14.5(V)	72"x37"	7,000 Lyrs	2023
Messier 29, NGC6913	20 24 00.0 +38 30 06	Cyg	O.C.	6.6(V)	6.0' x 6.0'	5,240 Lyrs	2024
NGC6946, "Fireworks Galaxy"	20 34 52.0 +60 09 15	Cyg	Gal.	9.6(V)	11.6' x 9.8'	22 MLyrs	2015, 16
NGC6960, W. Veil Nebula	20 45 54.0 +30 43 00	Cyg	S.N.	7.0(V)	60.0' x 9.0'	3,260 Lyrs	2025
NGC 7009, "Saturn Nebula"	21 04 10.9 –11 21 49	Aqr	P.N.	8.0(V)	70.0"	3,750 Lyrs	2015, 16, 23
NGC7026, "Cheeseburger Neb"	21 06 18.5 +47 51 08	Cyg	P.N.	12.7(P)	40.0"	6,800 Lyrs	2018, 23
NGC7331, Caldwell 30	22 37 04.5 +34 25 00	Peg	Gal.	9.4(V)	14.5' x 3.7'	50 MLyrs	2015, 16, 20
NGC7789, "White Rose"	23 57 26.6 +56 43 14	Cas	O.C.	6.7(V)	15.0'	8,000 Lyrs	2015, 16, 19
NGC 253, "Silver Dollar Galaxy"	00 47 32.9 –25 17 20	Scl	Gal	14.0(V)	27.7 x 7.0'	11.4 MLyrs	2016
NGC 891, The "Silver Sliver"	02 22 33.4 +42 21 03	And	Gal	9.93(V))	14.3' x 2.4	30 MLyrs	2017, 20
ι Cassiopeiae	02 29 04.0 +67 24 09	Cas	B.S.	4.6/6.9	2.5"	--	2020

The year, 2026, represents ten years of the Stellafane Telescope Observing Olympics. It therefore is appropriate to re-observe just a few of the most pleasing visual objects that many of us have enjoyed the last decade. As always, a successful observation of 15-objects results in a special pin being awarded. This is a very easy visual list and observers with modest aperture instruments should be able to successfully observe ALL of the listed objects. We hope you enjoy this listing of some of the most pleasing visual objects in the near universe.

Distances Calculated: 70 km s^{-1} Mpc^{-1}

Binary Stars:
ι Cass.

Asterisms
Ferraro 27
Kemble 2

Open Clusters
NGC6811
Messier 29
NGC7789

Globular Clusters
Messier 10
Messier 92

Nebulae
NGC6888
NGC281
Barnard 86
NGC6960

Planetary Neb.
NGC6210
NGC6369
NGC6543
Hubble 4
NGC6781
NGC6826
NGC7009
NGC7009
NGC6905
NGC7026

Galaxies
NGC6946
NGC7331
NGC253
NGC891

Galaxy Clusters
Seyfert's Sextet

Quasars
Markarian 205

Symbols:

B.S. –	Binary Stars
Ast. –	Asterisms
O.C. –	Open Clusters
G.C. –	Globular Clusters
Neb. –	Nebulae
P.N. -	Planetary Nebulae
Gal. –	Galaxies
Gal C.	Galaxy Clusters
QSO -	Quasar

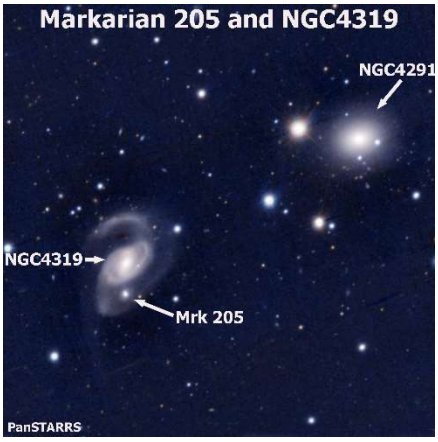
This Year's Gold Medal

Clear and Steady Skies –

Larry Mitchell – Eileen Myers

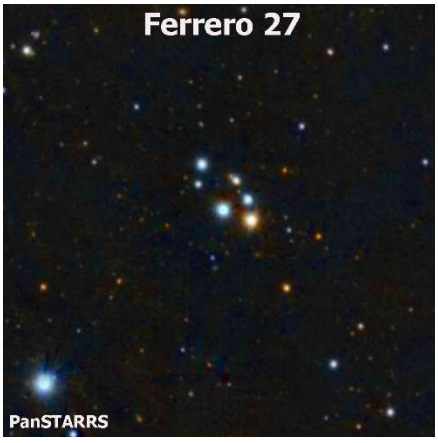
STELLAFANE OBSERVING OLYMPICS – 2026

10th Anniversary – A Brief Selection from the Visual Olympic Years

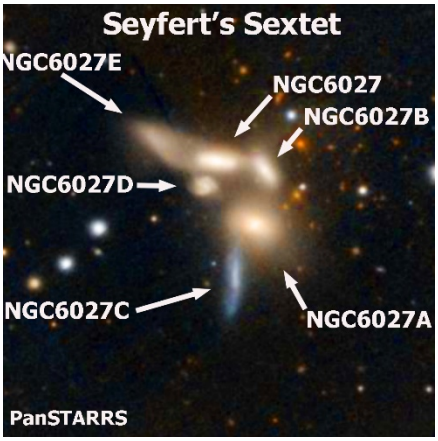


Markarian 205 is a low luminosity, radio quiet quasar, sometimes referred to as a BL Lacerta type object that is located only 40 arcseconds south of the nucleus of NGC4319. This equates to only 10,000 – 16,000 light years (3 – 5 kpc) from the larger galaxy, but this is an illusion. There has been a lot of controversy over these two objects as to whether they are physically connected to each other or merely are a chance alignment of sight. In 1971 Halton Arp showed there appeared to be an optical "light bridge" between Mrk 205 and NGC4319 and proposed the theory that the quasar was newly created mass and energy that has been expelled from the heart of the active galaxy, NGC4319, and therefore both objects were at the same relative distance from Earth. Arp and others followed this up with the idea that the redshift had nothing to do with distance, but rather was an indication of youth, where matter and energy are being newly created. These ideas were radical and flew in the face of most conventional astronomical theories. Arp never backed down however and took his ideas with him to the grave, stating he expected to be eventually proven right. Today we know this "light bridge" is really due to the quasar shining through part of a southern spiral arm of NGC4319. NGC4319 is a face-on barred spiral galaxy located 63.2 - 80.0 million light years away. Markarian 205 is now thought to lie some 15 times more distant than NGC4319, at about 1.2 billion light years and it is usually classed as a Seyfert type 1 object with a bright active nucleus, containing a 100 million solar mass b lack hole. Markarian 205 is relatively close to Earth for a quasar, and deep images show a slightly extended envelope of surrounding gas and stars.

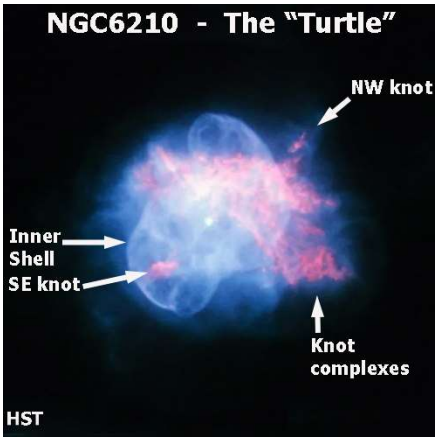
NGC5907 is an edge-on spiral galaxy located approximately 50 million light years from Earth and is also known as the "**Knife Edge"** or "**Splinte**r" Galaxy. Visually it appears as a very thin high surface brightness streak, notable for not having a central bulge, which is typical of most 'superthin' type galaxies. It is also unusual for having a very low metallicity with few detectable giant stars and is apparently composed predominantly of dwarf stars. Subtle warps in the outer regions of the disk hint at a past encounter with another object. In 2006 large telescopes discovered an extended tidal stream which encircle the galaxy, suggesting gravitational perturbations induced by another object. This structure has probably survived for several billion years, and the arcing structures form tenuous loops extending more than 150,000 light-years from NGC5907. The streams likely represent the ghostly trail of a dwarf galaxy that left debris along its orbit and was gradually torn apart and eventually merged with NGC5907 over four billion years ago. Another way to create a tidal stream is with a major merger event when two galaxies of approximately equal size interact gravitationally and eventually merge into one bigger galaxy. At present we do not know if this tidal stream was caused by a small or a large galaxy.



Ferrero 27 is an asterism located in Draco. An asterism is a group of stars which give the appearance of being gravitationally involved but they are actually located at vastly different distances and are moving independently of each other through space. Therefore, they are a random arrangement of stars. Visually Ferrero 27 stands out in a telescope field and all six stars should be visible. The brightest star in the group, located at the southwest tip has a distance of 5,680 light years while the next brightest star to its northeast is 1,080 light years away. Ferrero 27 was discovered by the French amateur astronomer Laurent Ferrero who maintains an internet list of interesting star groups that he's noticed during more than 20 years of deep-sky observing. His catalog currently consists of 53 objects and some of these have proven to be true open clusters.



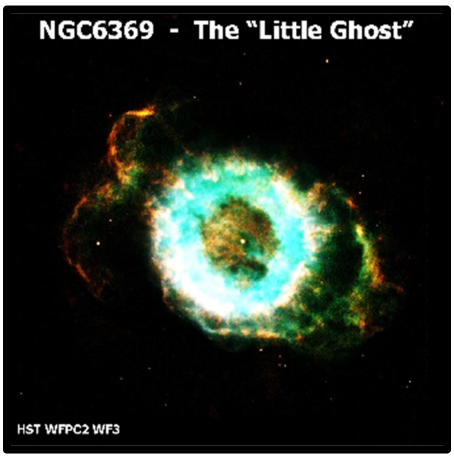
Seyfert's Sextet is a group of galaxies about 190 million light-years away located in Serpens. The group appears to contain six members (a Sextet), but one of the galaxies, NGC6027D, is a background object located about 700 million light years behind the group. Another object which is often incorrectly termed a "galaxy" is NGC6027E which is actually a part of a tidal tail emanating from the nearby galaxy NGC6027. The gravitational interaction among these galaxies should continue for hundreds of millions of years. Ultimately, the galaxies will merge to form a single giant elliptical galaxy. The French astronomer Édouard Stephan discovered NGC6027 on 20 March 1882, but he was unable to resolve the individual galaxies in the group. The group members were later discovered by Carl Keenan Seyfert using photographic plates made at the Barnard Observatory of Vanderbilt University. When these results were first published in 1951, this group was the most compact Galaxy group ever identified



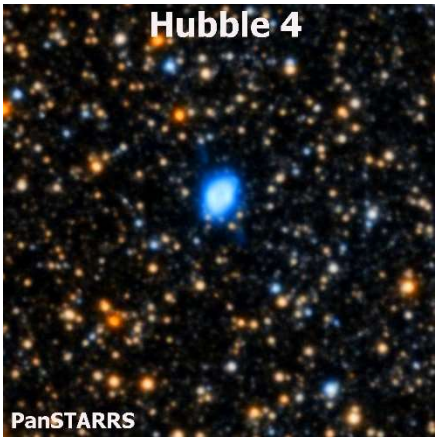
NGC6210 – Also known as "**the Turtle**", is a large planetary nebula with a very high surface brightness, and is located about 6,500 light years away in Hercules. The entire nebula measures 1.6 light-years across while the inner shell is about 0.5 light-years in diameter. The central star likely ejected its outer layers in several periods, with the initial ionization occurring about 3,500 years ago. The nebula was reshaped several times by fast stellar winds. NGC6210 is moving away from us at 14 kilometers per second. HST images of this object show jets of hot gas streaming through holes in the older, outer shell of gas. The nebula's spectacularly chaotic appearance has led to a conclusion that it was shaped by mass transfer in a triple star system resulting in five distinct ejection axes. The brightest part of the nebula is the inner shell which is elongated approximately NNW–SSE, with a peanut-like shape. The most emission lines seen are Hα λ6563 and [O III] λ5007. A larger and fainter intermediate shell is elongated on a roughly perpendicular axis and is not centered on the progenitor star and is offset to the WSW. It is somewhat unusual to see color in planetaries in amateur telescopes, but NGC6210 has such a high surface brightness that its round disk often visually shows a bluish color due to ionized Oxygen when observing this object.

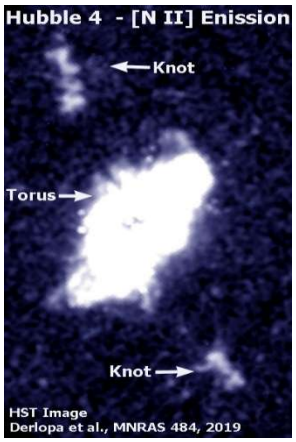
Messier 10 or **NGC6254** is a globular cluster located in Ophiuchus. It was discovered by Charles Messier on May 29, 1764, a Tuesday night, who described it as a "nebula without stars". William Herschel using his larger telescope of 18.75-inches aperture resolved M10 into stars. The tidal gravitational diameter is 38.6 arc-minutes which is about the apparent diameter of the Moon, but visually it appears only half this size, as its bright core dominates and is 35 light years across. The overall spatial diameter of M10 is 83 light years and it is approximately 14,300 light years away from Earth. It is one of the closest clusters to the Galactic center at only 16,300 light years, completing an orbit around the Galaxy in about 140 million years. Messier 10 has an age of 11.39 billion years and is moderately metal poor at [Fe/H] = -1.45 dex, which is only 3.5% the abundance of the Sun. M10 has an enrichment of elements generated through the s-process in massive stars and Type II supernovae, but it shows little evidence of enrichment by Type 1a supernovae which occur in large binary systems. Binary stars on average are more massive than normal stars, so they tend to migrate toward the center of clusters. The fraction of binary stars in the core region of M10 is about 14% and this proportion decreases with increasing radius to a population of only 1.5% in the outlying regions of the cluster. The density of stars in the core region is about 3.8 solar masses per cubic parsec and contains a concentration of interaction-formed blue straggler stars, most of which formed 2–5 billion years ago. Four variable stars have been found so far in Messier 10. Astronomers in the center of this cluster would never see a dark sky.

Messier 92Messier 92 or **NGC6341** was discovered by Johan Elert Bode in 1777 and inadvertently rediscovered by Charles Messier in 1781. The cluster is located in Hercules and is visible to the naked eye under very good conditions with an apparent Vmag. of 6.4. However, it is often overlooked by amateurs due to its close angular proximity to the bright Messier 13. M92 is one of the galaxy's oldest globular clusters with estimates of 11.0 billion years to as old as 13.5 billion years. This yields a very low metallicity of [Fe/H] = -2.20 which is only 0.5% of the solar elemental abundance. Its distance is 26,700 light years from the Sun and it has a tidal diameter of 30 arc-minutes, which contains approximately 200,000 solar masses of material. M92 is slightly flattened as its minor axis is about 89% ± 3% of the major, which is probably due to its movement through space. The core radius is only about 2 arc-seconds, but there is no evidence of any core collapse having taken place. M92 is an ***Oosterhoff type II*** globular cluster, meaning it belongs to the aged group of metal-poor clusters, below [Fe/H]= -1.6 with longer period RR Lyrae variable stars. The 1997 Catalogue of Variable Stars in Globular Clusters listed 28 candidate variable stars in the cluster, although only 20 have been confirmed. As of 2001, there were 17 known RR Lyrae variables in Messier 92, plus 10 X-ray sources, of which half are candidate cataclysmic variable stars. An eclipsing binary millisecond pulsar has been discovered in M92 with an orbital period of 0.20 days, which orbits a low-mass companion with a median mass of ~0.18 $M_\odot$. Visually M92 is riddled with dark lanes.

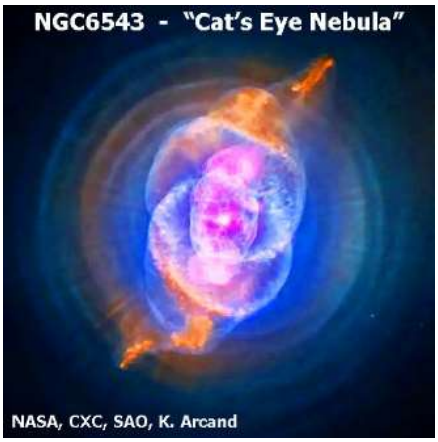


We are viewing the bi-polar planetary nebula **NGC 6369** from a pole-on orientation at a distance of over 2,000 light years. It possesses a double-shell morphology consisting of a round bright inner shell and a fainter filamentary outer shell or envelope. Two remarkable morphological features are extensions of the inner shell situated along the east and west directions. The western extension is a large, filamentary blister or ansae, while the east member is a bifurcated structure, divided into two branches or forks. The bright inner shell contains a system of 'cometary' knots and faint bipolar extensions and a filamentary envelope. The lack of kinematical evidence for shell expansion and the knotty appearance of the envelope are strong indicators that the envelope is a flattened structure at its equatorial regions. This ringlike structure is about a light year in diameter and glows from oxygen, hydrogen and nitrogen atoms which are colored in the photo blue, green and red respectively. The central star is a binary system and has a spectral type [WO3], which is most unusual, as this spectrum is similar to oxygen rich Wolf-Rayet stars. Wolf-Rayet stars typically have masses in excess of 25 solar masses and end their lives as supernovae explosions and not planetary nebulae. This is one of the finest visual ring planetary nebulae in the sky.

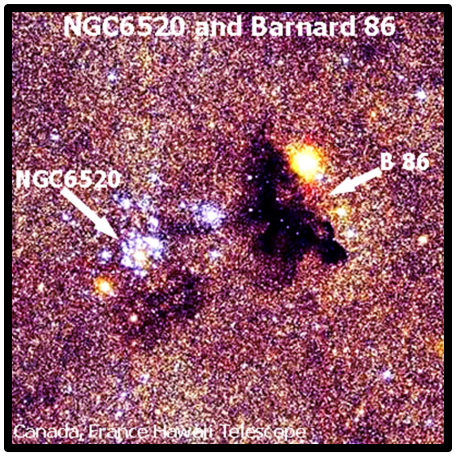




Hubble 4 is a high-excitation planetary nebula located in the Galactic disk and in the direction of the Galactic bulge, with an estimated distance of 8,300 light years (2.55 kpc). It is a multipolar nebula with an irregular structure and a deformed ring-like inner region. In the outer regions, Hb 4 also shows a pair of collimated, detached jets or elongated knots moving with a velocity of ~95 miles s^{-1}. These elongated, low-ionization knots protrude from either side of the main body of the nebula and are well collimated structures. The northern knot is off by approx. 5 degrees with respect to the axis defined by the southern counterpart as if a torque or warping from the collimating structure has taken place. A very faint secondary bipolar structure, close to the central region is aligned with the minor axis, which implies a poly-polarity for this nebula. The nucleus is both classified as a hydrogen-deficient star of W03 class and of a carbon WC4 classification. A possible link between jets and knots with binary systems and/or Wolf–Rayet (WR) central stars in planetary nebulae has been proposed. The knots are possibly FLIERs (Fast Low Ionization Emission Regions) which typically have expansion velocities of 15–125 miles s^{-1} with respect to the main bodies.

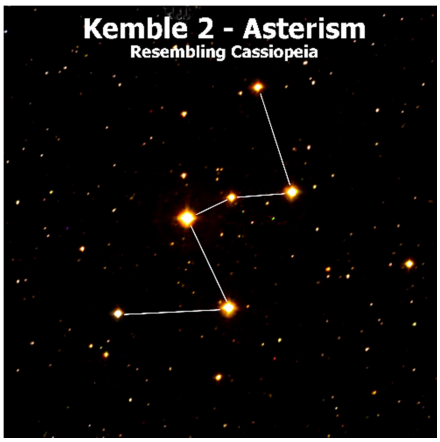


NGC6543 is a bright complex Planetary Nebula (PN) in Draco, also called the "**Cat's Eye Nebula**" and was discovered by William Herschel on Feb. 15, 1786. It was the first PN whose spectrum was investigated and this was conducted by the English amateur astronomer William Huggins. He found that Planetary Nebula were gaseous in nature and not stellar objects. It is located about 3,300 light years from the Earth, near the North Galactic Pole and has a combined magnitude of 8.1. Deep images reveal an extended outer halo of about 5 arcmin across which is the product of a slow wind ejected by the central progenitor star during its red giant phase. The bright nebula has a temperature of between 7,000 and 9,000 K with densities averaging about 5,000 particles per cubic centimeter. The outer Halo has a higher temperature around 15,000 K but of a much lower density. The fast stellar wind is expanding outward at about 1,200 miles/sec. and has hollowed out the inner bubble which has burst at both ends. Its age is based upon its angular expansion, so if it has been expanding at a constant rate of 10 milliarcseconds per year, then it would take 1,000 ± 260 years to reach its present 25" diameter. Spectroscopic analysis shows the current rate of mass loss averages 3.2×10^{-7} solar masses per year which is equivalent to 20 trillion tons per second. The binary central star has a surface temperature of about 80,000 K (our sun is 5,780 K) and is 10,000 times as luminous as the Sun, yet its diameter is only about 0.65 that of the Sun. It is calculated to be presently over one Solar mass which is down from an initial 5 Solar masses. Far infrared observation wavelengths (about 60 µm) reveal the presence of stellar dust at low temperatures, around 85K, believed to have formed during the last phases of the progenitor star's life. It absorbs light from the central star and re-radiates it at IR wavelengths. In 2001 the Chandra X-ray Observatory revealed extremely hot gas with temperatures 1.7 million K, due to the fast stellar wind's violent interaction with material previously ejected which has hollowed out the inner bubble of the nebula. The concentric rings were ejected in a series of pulses at 1,500-year intervals while the star was on the asymptotic giant branch and are evenly spaced indicating regular intervals. Each 'ring' is actually the edge of a spherical expanding bubble seen projected onto the sky which is why it appears bright along its outer edge. The pulsations that formed the rings probably started 15,000 years ago and ceased about 1000 years ago, when the formation of the bright central region began.

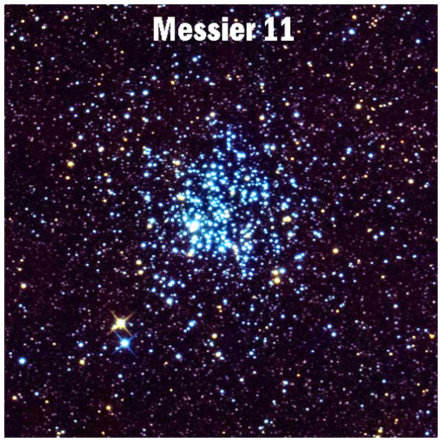


NGC6520 and Barnard 86. The Open cluster NGC6520 and the nearby Dark Nebula, Barnard 86, provide one of the most stunningly beautiful views found anywhere in the universe. The pair is superimposed over millions of stars that are located in the central core of the Milky Way Galaxy, yet the star cluster stands out well from the background, and the Dark Nebula's inky blackness is enhanced by this background glow. NGC6520 contains many bright blue-colored hot stars, an indication of youth, and has recently been found to be a much younger object than previously thought, at only 60 million years of age. The earliest stellar objects in the cluster are type B4 V stars which indicate a mass of 6 times Solar. Since we know the average lifetime of this type of stellar object (B4 V), which is 60 million years, we can deduce a Main sequence maximum age of 60 million years, for the cluster. Any more massive stars than this would have even shorter lifetimes and therefore would have disappeared. The most recent distance analysis derived a distance of 6,500 light years. This places the cluster and nebula on the outer edge of the Scutum-Centaurus spiral arm. The brightest star near the center of the cluster is a G8 I extremely massive star with a V magnitude of 8.9. It is an actual cluster member and not a foreground star.

Barnard 86 is found immediately to the west of the cluster and is a small dark nebula which was discovered by Edward Emerson Barnard who described it as a "drop of ink on the luminous sky". He was surprised this prominent object had not been previously discovered. B86 is a non-illuminated and non-ionized cloud, of dust and gas but it is not a "Bok globule", which are much smaller denser star forming regions. However, it is dense enough that a star on one side of the nebula would be invisible on the opposite side. The center of the nebula is only 6 arcminutes from the center of the star cluster and the two objects do not appear to be completely detached from one another. All studies indicate the two objects are located at relatively the same distance from us, however, they have very different radial velocities, and different proper motions, 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. They truly are "two ships passing in the night."



Kemble 2 is an asterism, which means it is a cluster of non-gravitationally bound members which are located at different distances and have diverse proper motions. It is located on the bend of the constellation of Draco and is often referred to as **"Mini Cassiopeia"** because of its close resemblance to the constellation. This stellar group was first named by Father Lucian Kemble in August, 1994 in a note to astronomer Arlid Moland. It was Moland who gave it the "Mini Cassiopeia" name. Independently of Kemble and Moland, Brazilian amateur Bruno Alessi cataloged this object as Alessi J18350+7223". The six stars range in visual magnitudes from 8.8 for the apparent faintest member to 6.8 Vmag. for the apparent brightest member in the center of the "W" shape. As such the asterism is readily seen in amateur instruments, and depending upon the observer, the finder scope may reveal the best view.

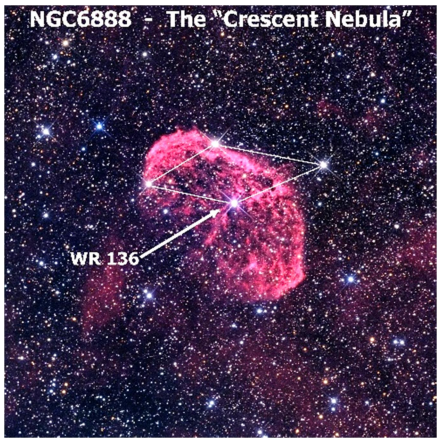


Messier 11 or **NGC6705** is called the "**Wild Duck Cluster**" due to the roughly V-shaped arrangement of its brightest stars resembling ducks in flight. M11 was discovered by the German astronomer Gottfried Kirch in 1681 and is located just to the east of the Scutum Star Cloud midpoint. It is located 6,200 light-years from Earth and has an apparent Vmagnitude rated from 5.8 to 6.3. Of the 26 open clusters included in the Messier catalog, M11 is the most distant that can be seen with the naked eye, but it is visually the most pleasing. It is one of the most densely populated open clusters known, containing over 2,900 stars, with a total estimated mass ranging from 3,700 MʘO to 11,000 MʘO. M11 is near the limit between the most massive open clusters and the least massive globular clusters. The cluster contains 870 members of at least a Vmagnitude of 16.5, while the brightest cluster member has a visual magnitude of 8.0. The overall cluster diameter is 22.8 arcminutes or 190 light years. Its age is 316 million years, resulting in metal-rich stars, with an iron abundance of [Fe/H] = 0.17 ± 0.04. Despite its youth, M11 shows an enhancement of Alpha process elements, which were formed within massive stars. Possibly this is due to an enhancement of its birth molecular cloud by a nearby Type II supernova explosion. At least nine variable star members have been identified with a high probability, plus 29 lower probability members. The cluster is located 22,000 light years from the galactic center and close to the galactic plane, and it has not wandered far from its birthplace

NGC6781, the "Snowglobe Nebula" is a prominent visual planetary nebula located 1,500 light years from the Sun. It has a visual magnitude of 11.4 and spans an angular size of 1.9 × 1.8 arcminutes. We are viewing the nebula from a near pole-on orientation, inclined at ~23° to the line of sight with its south side pointed toward Earth. The inner diameter of the barrel shaped spherical cylinder is 108 arcseconds with a barrel height of 90 arcseconds. The shell is expanding at 9.3 miles per second (15 km s^{-1}). The total mass of the shell is estimated at 0.86 MʘO, consisting of 0.54 MʘO of ionized gas, 0.12 MʘO of atomic gas, 0.2 MʘO of molecular gas, and 4×10^{-3} MʘO of dust grains. The bipolar dust shell of this nebula is also barrel-shaped and is rich in amorphous carbon, with temperatures ranging from 26 to 40 K. The outer diameter of the nebula, including the lobes, is 122 arcseconds which is equivalent to a physical radius of 0.44 light years (0.135 pc). The total mass of gas loss was 0.41MʘO with an estimated dust mass of 1.53 MʘO which was ejected as the central star passed through its last asymptotic giant branch (AGB) thermal pulse event. The surface brightness of NGC6781 in the optical is very low and rather uniform, indicative of its relatively evolved state. The low surface brightness is also because the ring emission is embedded in faint extended lobes that are elongated along the NNW-SSE direction, and we are viewing the ring through the blue-shifted lobe. The central star is a binary and the energizing member is a white dwarf of 16.88 magnitude, with a temperature of 121,000 K, but a luminosity of only 385 LʘO. Originally the white dwarf star had an estimated mass of ~2.25 – 3.0 MʘO, but has been depleted to a mass of 0.60 solar masses. It is currently terminating its planetary nebula evolution and passing into the white dwarf cooling track. The star left the AGB and entered the cooling stage around 9,400 years ago, while the red giant branch stellar ejecta has been expanding for 20,000 to 40,000 years. The central white dwarf's companion is a much cooler M-type co-moving star at a projected separation of under 5,000 Lyrs.

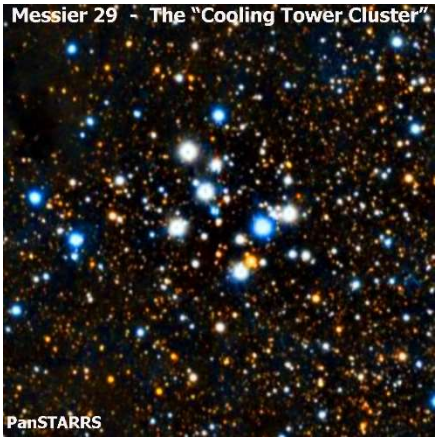
NGC6791, or **Berkeley 46,** was discovered by Friedrich August Theodor Winnecke in 1853 and is located at 13,000 – 16,000 light years from the Sun. It is one of the most populated star clusters, with a mass of approximately 4,000 solar masses. It is also one of the most unusual objects in the heavens, in that it has several features that just do not fit current scientific ideas of what is considered normal for stars and for open clusters. It is officially listed as an Open Star Cluster in Lyra, however it may really be a low mass Globular Cluster, or a transitional object between the two, or even the remnant core of a dwarf galaxy. Normally open clusters contain stars that were born out of the same nebulous cloud, at roughly the same time, and most clusters totally dissipate within a few hundred million years due to various gravitational effects. NGC6791 is considered to be the oldest known open cluster in the Galaxy with estimates ranging from 8.0 to over 12.0 BILLION years, an almost unbelievable statistic. However, in spite of its advanced age, NGC6791 is extremely metal-rich with [Fe/H] = ~+0.3 to +0.4, as determined from its evolved stars. This also is an almost unbelievable statistic which places the metallicity of NGC6791 at more than twice that of the Sun ([Fe/H] = 0.012), yet it is roughly twice as old as the Sun. NGC6791 therefore ranks as both one of the oldest open clusters and also is one of the most metal-rich objects in our Galaxy. NGC6791 especially contains excess abundances of Calcium and Nickel. This metal abundance is contrary to a basic astronomical concept where older celestial objects are expected to carry fewer metals, as the heavier elements just have not yet had enough time to form in the universe. Roughly 10 billion years ago, when NGC6791 came into existence, stars had only been in existence for a relatively short time period of only about 3 billion years. We now know the reason for this unusual circumstance is due to the overall massive gravitational attraction of the cluster due to the presence of its many stellar members which remained gravitational confined. Historically, when the original more massive stars ejected their newly formed heavier elements (metals) via AGB winds or supernovae, the intense gravitational field did not allow the ejecta to escape. The next generation of stars therefore formed out of this enriched environment resulting in a metal rich star cluster, while still being part of a very old grouping of stars. It required a long time for astronomers to figure this out.

NGC6826 – A Planetary Nebula located in Cygnus and commonly referred to as the **"Blinking Planetary".** The brightness of the central star overwhelms the eye when viewed directly, causing the surrounding nebula to seemingly disappear. It also can be viewed using averted vision which causes it to "blink" in and out of view as the observer's eye wanders. A distinctive feature of this nebula are two bright patches on either side, which are known as Fast Low-Ionization Emission Regions or more commonly FLIERS. They appear to be relatively young and moving outwards at supersonic speeds and are probably the initial ejection from the central regions of the dying star. They remain however something of a mystery as it appears from their shapes that they are stationary objects, and that material ejected from the star flows past them scraping gas from their surfaces. The formation of FLIERs cannot be easily explained by any models of stellar evolution. The FLIERS are composed of ionized Nitrogen while the rest of the halo's appearance is due to twice ionized Oxygen [O III]. NGC6826 is estimated to be 3,600 light years away and the nebula itself is between 0.4 and 0.5 light years across and is expanding at a relatively low (compared to other PN) 7 miles per second. However, NGC6826 is one of the few nebulae that is surrounded by a relatively bright outer halo, 65" in diameter which is about five times the size of the halo normally seen in planetary nebulae. This Outer Halo is over 2 light years across and is the result of earlier episodes of stellar mass loss which is illuminated by ultraviolet radiation from the star leaking into it. The central star, HD 186924, is an O-type star and has a visual magnitude of 10.7. Its temperature is about 47,000 Kelvin which is relatively cool for the central stars of planetaries. Its luminosity is 1,300 that of the Sun while its mass is only 0.55 that of the Sun. The star is still in the act of heating and when it reaches 100,000 K it will begin to cool and fade to nothing, the ultimate fate of common lower-mass white dwarfs.



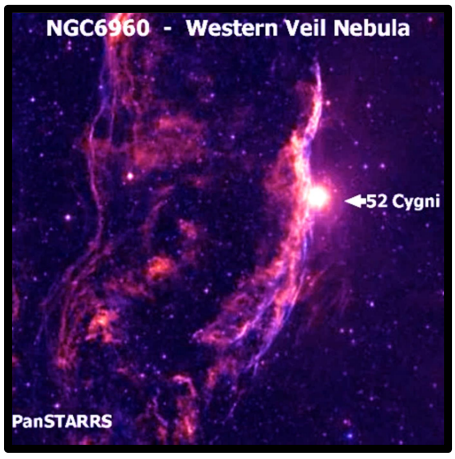
NGC6888, the "Crescent Nebula", is a Wolf Rayet Emission Nebula located at a distance of about 5,000 light years (1.5 kpc). Wolf Rayet stars are evolved massive stars in excess of 20 million solar masses that are likely to have gone through several stages of mass loss in the form of both fast and slow moving winds. The next stage in their stellar evolution will be an intense supernova event, if the star cannot lose enough mass to go below 8 solar masses. The stellar environment around stars provides important clues to their make-up and evolution, and the winds and ejecta are embedded within the environment of Wolf-Rayet stars. The stellar wind is accelerated from a velocity of around 10 km/sec in the red supergiant phase, to velocities on the order of 2,000 km/sec, which is typical of Wolf Rayet winds. The WR fast wind interacts with the slower Red Giant wind and sweeps up an accelerating shell, resulting in instabilities and fragments, producing dense knots and filaments seen in the photo. This interaction also produces large amounts of hot X-ray emitting gas. Later on, the shock becomes more concentrated in the polar regions of the star where the surrounding density is lower, which provides a convenient conduit for the wind. NGC6888 is 1.9 million years old and presents an ellipsoidal filamentary shell which is seen at optical wavelengths, but in X-ray light, two lobes are present in opposite zones along the major axis. The expanding shell is especially prominent in Hα, [NII] and [OIII] emissions and the [OIII] skin consists primarily of wind driven shocks. Overall, the nebula is ~15' long at the major axis and is expanding with a velocity of 85 km/sec. IRAS images reveal the presence of an even larger outer elliptical shell 1.7^o x 1.4^o in size and not surprisingly, this bubble has a cooler dust temperature than NGC6888. This outer shell has a diameter of 6.2 light years (1.9 pc) that was created in the red giant phase of the O-type star around 250,000 years ago. These outer shells are expanding in a relatively slow wind phenomenon but have been violently impacted by the later fast wind. This created two shock waves, with one moving outward which created the ionized nebulosity, and one moving inward which heated the stellar wind to X-ray emitting temperatures. The oblong clumpy shell of emission surrounds the now Wolf Rayet, WN6 (Nitrogen) star (HD 192163) which is completely surrounded by a cocoon of molecular gas. It is thought that initially a massive O-type star of over 40 Solar Masses evolved through a luminous blue variable phase before becoming the Wolf Rayet star WR 136 that we see today. The nebula responds very well to UHC filters in smaller telescopes and OIII filters in larger instruments. To locate NGC6888 find the irregular diamond shaped asterism located 2.7 degrees southwest of gamma (γ) Cygni.

NGC 6905, also known as the **Blue Flash Nebula**, is a planetary nebula in Delphinus and was discovered by William Herschel in 1784. The central star has a Vmagnitude of 14.0 and as commonly noted for planetary nebulae, its distance is not well determined, with estimates ranging between 5,540 and 8,475 light years. NGC6905 has an internal shell with angular dimensions of 47 × 34 arcseconds of roughly conical extension. It has a total gas mass between 0.31 $M\odot$ and 0.47 $M\odot$. FLIERS or ansae-type formations are located along the major axis and are particularly intense (see photo). NGC6905 belongs to a small group of very high excitation planetary nebulae that exhibit very strong emission lines of OVI near λλ3811, 3834, the so-called OVI sequence. Oxygen VI is a form of highly ionized oxygen detected in the ultraviolet spectrum and indicates a very energetic environment. The nucleus of NGC6905 possesses one of the broadest ultraviolet OVI emission lines found among all planetary nebulae, and even more energetic OVIII emission has also been detected in NGC6905. This indicates a very high degree of excitation in this planetary. The central star, HD193949, has a spectral type of [WO2], meaning it has a spectrum similar to Wolf–Rayet stars and is rich in oxygen. It is estimated to have a very hot surface temperature of 150,000 K, which produces the excitation. The spectrum also shows signs of neon emission lines (Ne VII and Ne VIII), seen only in very hot stars. Currently the central star has 0.31 to 0.47 times the mass of the Sun, but before becoming a planetary nebula it had a mass of about 1.07 M⊙ which is similar to that of the Sun. An analysis of *Gaia* data suggests that the central star may be a binary system, which is also indicated by its elongated shape.



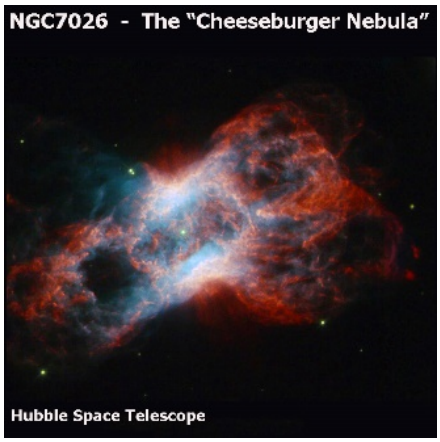
Messier 29 or M29, is also known as **NGC6913** or the **Cooling Tower Cluster**, is a prominent small, bright open cluster located just 1.7° south of the central bright star in Cygnus, Gamma (γ) Cygni. It was discovered by Charles Messier in 1764 while hunting for comets. Data from Gaia EDR3 gives a parallactic distance of about 5,240 light years, but there is some uncertainty due to the poorly known absorption of the cluster's light. It is located near the edge of the Great Cygnus Rift within the densely populated Orion-Cygnus spiral arm, which is our local arm, and our line of sight runs along the Local Arm. The distances to the clouds of the Great Cygnus Rift are estimated to be in the range of 2,282 to 2,930 light years (700–900 pc). M29 is also a member of the Cygnus OB1 stellar association, and some faint nebulosity is associated with the cluster, which was first noticed by Robert Trumpler. The overall extinction in this area is estimated at about 2 magnitudes. M29 is estimated to be only 5 million years of age and has an overall mass of 580 – 1,090 M□. The nine brightest and hottest stars are all giants of spectral class 09 – B2, and these stars range in brightness from 7.86 to 11.91 magnitudes. Its diameter is a small 11 light years and the Sky Catalogue lists it with 50 member stars. In this cluster very young pre-main-sequence stars of early-K subclasses are present at V = 13.5 magnitude.

NGC6946 – Also known as the "**Fireworks" Galaxy** it is an intermediate spiral galaxy located about 18 million light years away in the constellations of Cepheus. It was discovered by William Herschel on September 9, 1978. NGC6946 is highly obscured by interstellar matter of the Milky Way and is located very close to the plane of the galaxy. This has led to conflicting estimates of the distance from 10 million all the way to 22 million light years, with the latter distance usually accepted. The diameter of the galaxy is approximately 40,000 light-years or just about a third of the size of the Milky Way and from our vantage point we see the galaxy face-on. In the last 100 years nine supernovae have been discovered inside NGC6946, making it the most prolific known galaxy for this type of event, hence the name 'fireworks'. For comparison the Milky Way galaxy with twice the number of stars as NGC6946 averages only one supernova event per century. From the core outward, the galaxy's colors change from the yellowish light of old stars in the center to young blue star clusters and reddish star forming regions along the loose, fragmented spiral arms. NGC6946 is also bright in infrared light and rich in gas and dust, exhibiting a high star birth and death rate which furnished the supernovae seen.

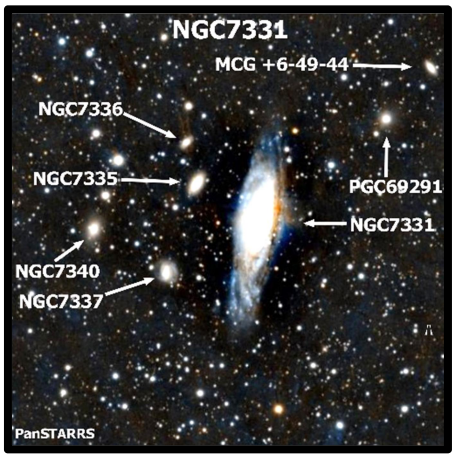


NGC6960 is also known as the **"Witches Broom"** and is the western part of the **Veil Nebula**. The bright Vmag. star 52 Cygni is an orange star located 291 light years away and appears to illuminate the nebulosity but is a foreground object which is photo-bombing the photo and has no affiliation with the nebula. It is a G9 spectral type class star which means it is a giant star that is cooler and larger than our Sun. It is also a double star with a faint companion star located about 6.0 arc-seconds away which is visible in amateur telescopes. NGC6960 is only part of the Veil Nebula which is a core collapse supernova remnant of heated and ionized gas. The source of the nebulosity was a star ~20 times more massive than the Sun which exploded between 10,000 and 20,000 years ago. The explosion occurred in a cavity evacuated by the progenitor star, and the star has never been discovered, and probably no longer exists. The supernova would have appeared brighter than Venus in the day sky. The remnants have since expanded to cover an area of the sky roughly 3 degrees in diameter which is about 6 times the diameter of the full Moon. The distance from Earth is roughly 3,260 light-years and its overall diameter is 130 light years, with an expansion velocity of about 930,000 miles per hour. The Hubble Space Telescope between 1997 and 2015 directly measured this expansion at 0.03 arcseconds per year. The visual rope-like filaments are less than 1/100,000 of the filament diameter and their width is twice the distance from the Earth to Pluto. In amateur instruments the nebulosity responds very well when using an O III nebula filter.

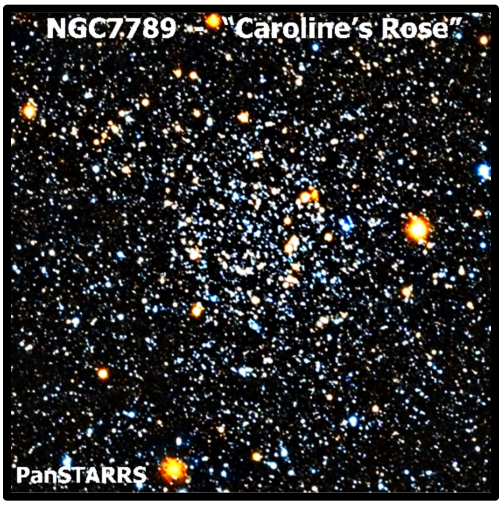
NGC7009 or the "**Saturn Nebula"** is a large planetary nebula located 1 degree west of the star Nu Aquarii. It was discovered by William Herschel on September 7, 1782 at Datchet (near Windsor) using his "20-feet telescope" which had a 12.0-inch mirror. The name 'Saturn Nebula' was named by Lord Rosse in the 1840s using his 72-inch "Leviathan" telescope. It gets its name from its resemblance to the planet Saturn with its rings seen nearly edge-on to the observer. The distance to NGC7009 is not known precisely but estimates range from 3,750 to 6,520 light years, with 3,750 light years the most recent (Gaia 2018). It has a diameter of 0.5 light years for the entire object and its negative radial velocity of -28 miles per second means it is moving toward the Earth. The Saturn Nebula is a very complex object and contains many sub-systems in three dimensions, including a halo, jet-like streams, multiple shells, ansae ("handles"), and small-scale filaments and four knots. The central portion measures 25 × 17 arcseconds, while the outer shell extends to 41 × 35 arcseconds. The inner main and outer shells result from two successive major ejections, and the physical conditions of the central star must have been different when these shells first formed. The central hot bubble is expanding at 81 – 93 miles s^{-1} (130-150 km s^{-1}). The four knots and the outer ansae expand faster than the main shell and appear to have been formed by two to three eruptions at different epochs from the primary structure formation. The ansae are expanding from the central star and represent one of the earliest episodic expulsions of material from the star. The central star is a very hot bluish dwarf with a temperature of 82,000 K, a visual magnitude of 11.5 and a luminosity of only 20 times Solar. Visually the nebula appears as a greenish-yellowish hue in amateur telescopes, which is the product of strong ultraviolet irradiation from the central star, which creates this characteristic fluorescent green tint of the nebula via the radiation of doubly ionized oxygen. A relative low amount of stellar extinction provides the fine views enjoyed in amateur instruments.



NGC7026, **The Cheeseburger Nebula** is a well-studied and highly ionized complex bipolar object, which is also one of the most peculiar planetary nebulae. It is located at an estimated distance of 6,800 light years, with an age of approximately 15,000 years. The central star has a Vmagnitude of 14.2 and an estimated temperature of 80,000K to 130,000K, with luminosity 2,100 times that of the Sun. This results in a strongly ionized nebula. The illuminating central star is a hydrogen deficient Wolf-Rayet type star with strong carbon emission lines resulting in a WC3 spectral type. It is probably a dwarf star located in a binary star system, which once was a massive object, but this is yet to be proven. The terminal wind velocity has been measured at 2,175 miles per second, so this is a highly energetic object. As with many planetaries, shock heated gas is produced when the fast wind collides or plows into the dense slow-moving wind produced when the star was in the asymptotic giant branch (AGB) stage. The present core mass of the star is 0.56 solar and it is estimated the parent star would have originally had a mass just over 1.1 times that of the Sun. There is a central spherical shell and the lobes are split into four major material outflow sections which are oriented northwest, southwest, northeast, and southeast. There is a gap in the visually faint southeast lobe which is open ended and blown out while the other lobes appear to be closed. The bipolar structure is still in the early stages of formation. Diffuse X-ray emissions are all confined to the bipolar lobes which reveal a plasma temperature of 1.1 million degrees K. The main symmetry of NGC7026 is nearly north-south and the northern lobe is slightly more compact with a distance of 27 arcseconds away from the central star. The northern lobe points away from the Earth, while the southern lobe is blueshifted. In larger amateur instruments at high powers NGC7026 resembles a hamburger seen from the side, with two buns which are thicker in the middle and a dark lane separating them in the center which resembles the burger, seen from the side. Visually it is unusual in appearance but also spectacular.



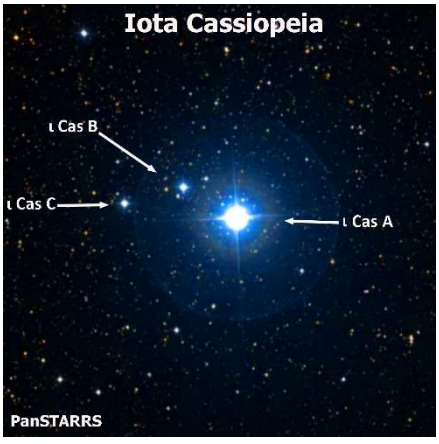
NGC7331 – This is a Spiral Galaxy located about 50 million light years away in Pegasus and it is one of the brighter Galaxies not included in Charles Messier's 18th century catalog, being visible in binoculars. It was discovered by William Herschel in 1784 and is the brightest member of a group of Galaxies which for some reason is sometimes referred to as the "***Deer Lick Group***." It is similar in size and structure to the Milky Way Galaxy and has been referred to as our Twin Galaxy in the past. Recent discoveries have cast doubt on this similarity, however. If astronomers, located somewhere inside NGC7331, are looking this way at the Milky Way Galaxy then they would see a very similar image. In most Spiral Galaxies, the central bulge typically rotates along with the disk in the same direction, but the bulge in NGC7331 is rotating in the opposite direction to the rest of the disk. The current bulge may have formed from infalling material, however if it had been there since the formation of the galaxy then it would be difficult to explain how such a situation arose. Often counter-rotating ring structures have been stated to be the result of a past merger event of relatively equal massive galaxies. A complete molecular ring exists around the central region, and the high inclination (~72°) of the galaxy permits us to glimpse the internal walls of this molecular ring. NGC7331 has multiple spiral arms and is rich in HII regions, similar to the Orion Nebula in our Galaxy, so star formation is active in the spiral arms at a high rate of 2.74 $M\odot\ yr^{-1}$. Larger amateur telescopes reveal the prominent dust lane and the presence of nearby smaller galaxies which are roughly ten times farther away and are not interacting with NGC7331. Nearby 1.5 degrees to the SW is the first compact group of Galaxies discovered, known as **Stephan's Quintet**, which is visible in large amateur telescopes. The largest and brightest member of the quintet, NGC7320, is actually a companion of NGC7331, while the five other fainter Quintet members are part of the fainter NGC73331 surrounding galaxy group, which is ten times more distant. NGC7331 is a beautiful galaxy in amateur instruments.



NGC7789 – A beautiful large Open Cluster in Cassiopeia, discovered by Caroline Herschel in 1783. This cluster is also 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. It is about 8,000 light years away and about 1.6 Billion years old, which is relatively old for an Open Cluster. This is due to its large member population which gravitationally tends to prevent stars from escaping the cluster. NGC7789 is over 50 light-years across and spans half a degree (the angular size of the Moon) in the sky. All the stars in the cluster were likely born at the near same time, but the brighter and more massive ones rapidly exhausted their hydrogen fuel in their cores and have disappeared. The remaining members are either dwarfs or are slightly more massive stars which have evolved from the Main Sequence and are Red Giant Stars which are hinted at in large telescopes, appearing as yellowish to orange stars. Some of these stars would be G2 spectral type stars like the Sun. Also NGC7789 contains several blue straggler stars which are the product of stellar mergers which result in a more massive star which falsely mimics younger objects. This Open Cluster is visible in binoculars and Walter Scott Houston wrote that "NGC7789 is one of those rare objects that is impressive in any size instrument." It is visually beautiful and everybody should see this.

NGC253, The **"Sculptor Galaxy"** or the **"Silver Coin Galaxy"** is an intermediate spiral galaxy in Sculptor and is one of the brightest galaxies in the night sky at a distance of around 11.4 million light years. Intermediate galaxies are a classification between spiral and elliptical galaxies. it is a starburst galaxy which is currently undergoing a period of intense star formation. NGC253 was discovered by Caroline Herschel in 1783 during one of her comet searches. In 1961, Allan Sandage wrote in *The Hubble Atlas of Galaxies* the Sculptor Galaxy is "the prototype example of a special subgroup of Sc systems". Photographic images of galaxies of the group are dominated by the dust patterns. Dust lanes and patches of great complexity are scattered throughout the surface. Spiral arms are often difficult to trace and the arms are defined as much by the dust as by the spiral pattern. NGC253 is also a strong radio source. It is located in the center of the Sculptor Galaxy group and is its brightest member. Its starburst has created several super star clusters (SSCs) with the largest having a mass of 140 million solar masses and an age of 5.7 million years, and it is rich in Wolf Rayet stars. Another SSC is 1.5 million solar masses while two others have 500,000 solar masses. These are huge numbers for star clusters and the super star clusters are arranged in an ellipse around the center of NGC253, which from the Earth's perspective appears as a flat line. Star formation is also enhanced on the northeast side of the disk where a number of red supergiant stars are located along with a halo of young stars. This suggests a gas-rich dwarf galaxy collided with NGC253 around 200 million years ago. A super massive black hole lurks in the center with a mass of about 5 million solar masses.

NGC891, The "Silver Sliver Galaxy" or the "Outer Limits Galaxy" is an edge-on unbarred spiral galaxy located about 30 million light-years away in Andromeda and noted for its prominent dust lane. It was discovered by William Herschel on October 6, 1784 and is a member of the NGC1023 group of galaxies in the Local Supercluster. NGC 891 looks as the Milky Way would look like when viewed edge-on and both Galaxies have similar properties of luminosity and size. Unusual filamentary patterns extend outward into the halo of the galaxy and away from the galactic disk. Dust emission is detected out to ~13,000 light years or ~4 kpc away from the disk, in the form of filaments, arcs, and super-bubbles. Some of these filaments can be traced back to regions with recent star formation activity, but supernovae activity probably is also responsible. The halo gas rotates more slowly than the disk gas which is unusual. In 1986 Supernova **SN 1986J** was discovered on August 21, 1986 in NGC891 at an apparent magnitude of.



Iota Cassiopeiae or ι Cassiopeiae is a quintuplet star system which has an overall Vmagnitude of 4.5 and is located 133 light-years from Earth. Its brightest member, **iota Cas A,** is a tight binary system with the stars sub-designated as Aa and Ab. ιCas Aa is an A3p-type main sequence star, with a Vmag. of 4.61, which has a mass 1.98 times Solar, a diameter 4.6 times that of the Sun, and a rotation period of 1.74 days. Being an A-type star, it has a temperature of 8,360 K which is considerably hotter than the Sun (~5,500 K) and an age of only 100 million years. Its fainter companion, Ab, is a G-type star with a mass of 0.98 Mʘ and an orbital period is about 49 years. The primary is also a variable star, with the Ab member varying in brightness from Vmag. of 4.65 – 8.48. **Iota Cass B** is a yellow-white F5-type main sequence dwarf with an apparent magnitude of +6.87 and it orbits around ι Cass A approximately every 2,400 years, with a semi-major axis of around 6.5 arcseconds. It has a mass of 0.96 Mʘ, a diameter 2.05 times that of the Sun with a temperature of 6,540 K. The third bright star, **Iota Cassiopeiae C,** is also another binary, designated Ca and Cb, with masses of 0.96 Mʘ and 0.70 Mʘ and temperatures of 4,520 and 3,590 K respectively. The spectral types of the two stars are K4 for Ca and M3 for the Cb star. It is currently at an angular distance of about 7 arcseconds from the AB pair. Since the semimajor axis of the AB orbit is about 6.5 arcseconds, the true semimajor axis of C's orbit around them is thought to be significantly larger than 7 arcseconds.

Each and Every Object in the Universe is Unique

A little Knowledge turns a Faint Object Barely Visible

Into a Fascinating Incredible Experience Enabling the Mind to Soar

We build Telescopes – We Use Telescopes

"sudum ad astra"

Clear Skies – To the Stars

*L*arry *M*itchell - *E*ileen *M*yers

Stellafane Observing Olympics – 2026
10th Anniversary – A Brief Selection from the Visual Olympic Years