Andromeda - Constellation Guide

Andromeda
Andromedae
And
The Chained Woman

Introduction

Andromeda is located in the northern part of the sky away from the plane of the Milky Way. It was one of the original 48 constellations plotted by second century astronomer Ptolemy and remains today as one of the modern 88 constellations defined by the IAU (International Astronomical Union). Andromeda is named after the princess in Greek Mythology who was the daughter of King Cepheus and Queen Cassiopeia. Legend has it, she was chained to a rock on the coast to be sacrificed in order to save the land from the large sea monster, Cetus. Returning Perseus came across the shackled princess and lay in waiting for the monster, before killing it and then marrying the princess.

For amateurs, Andromeda contains one famous galaxy, many faint galaxies, a selection of nice double stars, a couple of bright open clusters, a few variable stars and a beautiful planetary nebula. The deep sky object that dominates the constellation is the spectacular Andromeda galaxy (M31), which is the largest member of our Local Group. At 2.54 Million light-years, it's the most distant object in the night sky that's easily visible with the naked eye.

Andromeda is best seen from Northern Hemisphere latitudes during the months of October, November and December.

Interesting Stars

Brightest Stars

Alpheratz or Sirrah (alpha Andromedae - α And) - is a binary star consisting of a luminous blue-white (type B8) primary in close orbit with a white (type A3) secondary. Together they shine with a combined magnitude of +2.07, but are too close together to be separated optically.

Although officially part of Andromeda, Alpheratz is the northeastern star of the prominent "Great Square of Pegasus" asterism. Previously it was assigned to both constellations and was also known as delta Pegasi (δ Peg). Nowadays it's referred to only as α And, the δ Peg reference was officially dropped by the IAU when fixing the modern constellation boundaries.

The system is 97 light-years distant.

Mirach (beta Andromedae - β And) - is a red giant star of type M0. It varies in magnitude from about +2.01 to +2.10, which means when at its most luminous it's the constellation brightest star. When not, Alpheratz holds the crown.

Mirach is located 197 light-years distant. Faint lenticular galaxy NGC 404, also known as Mirach's Ghost, is positioned just seven arc minutes northwest of Mirach.

Brightest Stars, Multiple Star

Almach (gamma Andromedae - γ And) - is a four star system located 358 light-years distant. It appears through small scopes as an outstanding colourful double star, consisting of a yellow or slightly orange primary (mag. +2.3), separated by 9.4 arc seconds, from a fainter blue secondary (mag. +5.0). They are widely regarded as being the second best colour contrast double in the sky, surpassed only by stunning Albireo in Cygnus.

Of the main two stars, the fainter blue secondary star is actually a triple star. Through amateur scopes, it can be split into components of magnitudes +5.1 and +6.3. With a separation of only 0.3 arc seconds, apertures of at least 250mm (10-inch) along with excellent seeing conditions are required. The brighter member of the pair is also a spectroscopic binary.

Double Stars

Pi Andromedae (π And) - is a blue white star of magnitude +4.3 with a magnitude +7.1 white companion. They are separated by 36 arc seconds and easily resolvable with small telescopes. A fainter 11th magnitude star is also visible in larger scopes (sep. 55 arc seconds).

56 Andromedae - Located just southwest of open cluster NGC 752 is 56 Andromedae, a magnitude +5.7 double star. This wide spaced double can be easily split with binoculars, separation is almost 3.35 arc minutes (201 arc seconds). The component stars are very similar in appearance, both yellow in colour and of almost equal brightness (mag. +5.8 and mag. +6.1). This double is a chance alignment of stars and not a true gravitationally bound pair.

Struve 3050 - is a challenging double for owners of 80mm (3.1-inch) scopes, but relatively easy with a small increase in aperture. Like 56 Andromedae it consists of two almost identical brightness yellow components of magnitudes +6.5 and +6.7, but separated by only 2.4 arc seconds. With a magnification of about 150x, a 150mm (6-inch) scope will easily split them and on nights of good seeing. A 100mm (4-inch) scope should also do the job.

36 Andromedae (Struve 73) - a nice double to test the quality of your optics and seeing conditions. It consists of magnitude +6.1 and +6.5 components, separated by 1.1 arc seconds. It can be split with a 150mm (6-inch) scope under excellent seeing conditions, high magnifications of between 250 and 300x should do the trick.

59 Andromedae (Struve 222) - is an outstanding double for small scopes that's located 4 degrees south-southeast of Almach. Both stars are pure white (mag. +6.1 and +6.7) in colour and are separated by 16 arc seconds. A magnification of 40x will split them.

Struve 79 - another fine double star for small scopes and easy to locate, only 4 degrees northeast of the Andromeda Galaxy. Both stars are white, magnitudes +6.0 and +6.8, with a separation of 7.9 arc seconds. Use powers of about 70x to easily resolve it.

Groombridge 34 - One of the closest double stars to Earth at 11.7 light-years distant. Although not bright or spectacular, Groombridge 34 is an interesting double as it consists of two red dwarf stars in a near circular orbit. Spatially about 147 AU separates them, roughly equal to five times the distance between the Sun and Neptune. The red dwarf stars are separated by 35 arc seconds and shine at magnitudes +8.1 and +11.1. They are easily within the range of medium size scopes. In August 2014, a planet orbiting Groombridge 34 was discovered.

Variable Stars

R Andromedae - is a long period variable star of the Mira type that changes between magnitude +5.3 and +15.1 over a period of 409 days. At its brightest it's visible to the naked eye and easily seen with binoculars. R Andromedae can be found just northeast of a triangle of faint naked eye stars consisting of theta Andromedae (θ And - mag. +4.6), rho Andromedae (ρ And - mag. +5.2) and sigma Andromedae (σ And - mag. +4.5). It is 1,730 light-years distant.

W Andromedae - another good example of a Mira type variable star is W Andromedae. It varies from magnitude +6.7 to +14.6 over a period of 397 days and at its brightest, although not visible to the naked eye, is easily seen with binoculars.

Nova

OS Andromedae - or Nova Andromedae 1986 reached magnitude +6.3 in December 1986 and for a few days was visible with binoculars.

Deep Sky

Galaxies

M31 (NGC 224) - the Andromeda Galaxy is a spectacular spiral galaxy and one of night-sky's most celebrated deep-sky objects. At magnitude +3.4 it's easily visible to the naked eye, appearing as a large elliptical fuzzy patch of light. It's more prominent with binoculars and small scopes. The observational history of this galaxy goes back a long time. It was seen and recorded by Persian astronomers in 964 AD and was almost certainly known for many years before that. Our ancestors, who were blessed with dark unpolluted skies, would have had no problem spotting M31 on clear dark Moonless nights.

A small scope of 80mm (3.1-inch) aperture on nights of good seeing will also show the main dust lanes that span the galaxy with larger scopes displaying finer details. Also visible are M32 and M110, the two main satellite galaxies of M31, which are equivalent to our Magellanic Clouds. M32 is positioned 0.5 degrees south of M31's core, with M110 located over a degree northwest of the core.

M31 is located 2.54 Million light-years from Earth and is the largest member of our Local Group. It's the most distant object easily visible to the naked eye. In total, M31 covers 3.2 x 1.0 degrees of apparent sky and is estimated to contain 1 trillion stars. The full extent of the galaxy is only revealed in images and long exposure photographs.

M32 (NGC 221) - is a dwarf elliptical galaxy that's the brightest satellite galaxy of M31. It was discovered by Guillaume Le Gentil on October 29, 1749. Shining at magnitude +8.1, with a high surface brightness, the galaxy is visible with binoculars and an easy object for small scopes. It's appears oval shaped but without much detail. In total, it covers 8.5 x 6.5 arc minutes of apparent sky and is located 0.5 degrees south of M31's core.

M110 (NGC 205) - at magnitude +8.7, M110 is the second brightest satellite galaxy of M31. Like M32 it's a dwarf elliptical galaxy, but unlike M32 suffers from low surface brightness and therefore much more difficult to spot. Through telescopes, it appears as a large oval nebulosity with a slightly brighter centre.

M110 was discovered by Caroline Herschel on August 27, 1783. It was not included in Messier's final catalogue version but added much later in 1967. In total, it covers 22 x 11 arc minutes of apparent sky.

NGC 404 - an easy galaxy to find in Andromeda is small dwarf lenticular, NGC 404. It's located 7 arc minutes northwest of second magnitude Mirach. NGC 404 glows at magnitude +11.9, has a high surface brightness and therefore within the range of medium size scopes. The observational difficulty with NGC 404 is the overpowering glare from the bright star. On dark nights, 150mm (6-inch) scopes at low powers will show the galaxy and the star in the same field of view. You can then move Mirach out of view and push up the magnification for a closer look at NGC 404.

Because of its faint wispy appearance and close proximity to Mirach, NGC 404 is often referred to as Mirach's Ghost. In total, it covers 3.5 arc minutes of apparent sky, but appears about half this size through amateur scopes.

NGC 7640 - is a near edge on barred spiral galaxy for medium and large telescopes. The galaxy is located 4 degrees southwest of planetary nebula NGC 7662, the Blue Snowball Nebula. NGC 7640 shines at mag. +11.6 and when seen through a 200mm (8-inch) scope appears as a very slim needle of nebulosity with a brighter central bulge. A very large 16-inch (400mm) aperture instrument reveals dust bands, mottling and fine details around the nucleus.

NGC 891, also known as the Silver Sliver, is one of the best edge-on galaxies in the sky. It's an unbarred spiral galaxy that's located 30 million light-years distant. The Silver Sliver spans 13.5 x 2.5 arc minutes, which represents an inclination of about 1.5 degrees from our perspective. Although it shines at mag. +10, it's easy to find since it's positioned 3.5 degrees directly east of bright star, Almach. However, NGC 891 is a difficult small scope object due to its magnitude and low surface brightness. A 150mm (6-inch) or 200mm (8-inch) instrument shows a thin needle of nebulosity with a bright central core. On nights of good seeing, it's possible to spot a narrow dust lane bisecting the galaxy's long axis. Large amateur scopes show variations in the dust band with many foreground stars populating the view.

NGC 891 was selected to be the first light image of the Large Binocular Telescope at Mount Graham International Observatory in Arizona, USA.

Planetary Nebula

NGC 7662 - also known as the Blue Snowball Nebula or Snowball Nebula, is one of the brightest planetary nebulae in the sky and one of the easiest to spot with small scopes. This planetary is positioned 0.5 degrees southwest of star 13 Andromedae (mag. +5.7) and when viewed through small scopes appears like a mag. +8.6 blue-green star. Due to its small size of 32 x 28 arc seconds, magnifications of 100x or so are required to reveal a slightly elliptical shaped object.

A 200mm (8-inch) aperture scope will show the dark centre of NGC 7662 although a magnification of at least 250x is recommended. NGC 7662 is actually a doubled ringed planetary, with a bright well defined central ring of gas, surrounded by a much larger, dimmer and hazier envelope. The other halo, along with the faint central star (mag. +13), require the largest of amateur scopes to be seen.

The distance to NGC 7662 is not well known and is estimated to be between 2,000 and 4,000 light-years.

Open Clusters

NGC 752 - is a large sprawling open cluster that's easily visible with binoculars. It's one of the finest large open clusters in the sky, containing at least 70 stars, spread across more than a degree of apparent sky. The combined apparent magnitude is +5.7 and therefore it's just about visible to the naked eye, but only under dark skies and excellent seeing conditions.

NGC 752 is located 5 degrees south and slightly west of Almach. Through binoculars it appears a large fuzzy patch of light with the brightest dozen stars resolvable. The best views of NGC 752 are with small telescopes / wide field scopes or medium size scopes at low magnification. When seen through 100mm (4-inch) or 150mm (6-inch) instruments, it's a wonderful site with dozens of stars resolvable.

The cluster was discovered by Caroline Herschel in 1783 and is estimated to be 1,300 light-years distant.

NGC 7686 - contains about 40 stars across 15 arc minutes of sky. At magnitude +5.6, the cluster is faintly visible to the naked eye but a fine view in binoculars / small telescopes. The orange giant star HD 221246 (mag. +6.2) is the stand out star that's located close to the centre. NGC 7686 lies 900 light-years distant.

Andromeda Star Data Table

Henry Draper Catalogue (HD)	Hipparcos Catalogue (HIP)	Bayer	Flamsteed	Struve	Name	RA (J2000)	DEC (J2000)	Visual Mag.	Var.	Var. Mag. Range	Period (days)	Double	Sep. (arc secs)	PA (deg.)	Mag. Primary. Sec
358	677	Alpha And	21	---	Alpheratz	00h 08m 23s	29d 05m 26s	2.07	---	---	---	---	---	---	---
6860	5447	Beta And	43	---	Mirach	01h 09m 44s	35d 37m 14s	2.07	---	---	---	---	---	---	---
12533	9640	Gamma And	57	205	Almach	02h 03m 54s	42d 19m 47s	2.10	---	---	---	Y	9.4	63	2.31 / 5.02
3369	2912	Pi And	29	---	Pi And	00h 36m 53s	33d 43m 10s	4.34	---	---	---	Y	35.7	174	4.36 / 7.08
11749	9021	56 And	56	---	56 And	01h 56m 09s	37d 15m 07s	5.69	---	---	---	Y	201	299	5.80 / 6.10
5286	4288	36 And	36	73	36 And	00h 54m 58s	23d 37m 42s	5.46	---	---	---	Y	1.1	327	6.12 / 6.54
13294	10176	59 And	59	222	59 And	02h 10m 53s	39d 02m 22s	6.09	---	---	---	Y	16.2	36	6.05 / 6.71

224635	118281	---	---	3050	Struve 3050	23h 59m 29s	33d 43m 26s	5.81	---	---	---	Y	2.4	338	6.46 / 6.72
5788	4675	---	---	79	Struve 79	01h 00m 04s	44d 42m 48s	5.69	---	---	---	Y	7.9	194	6.04 / 6.77
1967	1901	R And	---	---	R And	00h 24m 02s	38d 34m 37s	5.80	Y	5.3 -> 15.1	409.33	---	---	---	---
14028	10687	W And	---	---	W And	02h 17m 33s	44d 18m 18s	6.70	Y	6.7 -> 14.6	397.30	---	---	---	---
1326	1475	---	---	---	Groombridge 34	00h 18m 23s	44d 01m 23s	8.01	---	---	---	Y	35	65	8.09 / 11.06

Andromeda Deep Sky Data Table

M	NGC	Caldwell	Name	Type	RA (J2000)	DEC (J2000)	App. Mag.	App. Size	Distance (light-years)	Actual Size (light-years)
31	224	---	Andromeda Galaxy	Spiral Galaxy	00h 42m 44s	41d 16m 06s	3.4	3.2 deg x 1.0 deg	2,540,000	140,000
110	205	---	---	Dwarf Elliptical Galaxy	00h 40m 22s	41d 41m 26s	8.7	22' x 11'	2,690,000	17,000
32	221	---	---	Dwarf Elliptical Galaxy	00h 42m 42s	40d 51m 52s	8.1	8.5' x 6.5'	2,650,000	6,550
---	752	28	---	Open Cluster	01h 57m 48s	37d 51m 00s	5.7	1.25 deg	1,300	14
---	891	23	Silver Sliver	Unbarred Spiral Galaxy	02h 22m 33s	42d 21m 03s	10	13.5' x 2.5'	30,000,000	120,000
---	7662	22	Blue Snowball Nebula	Planetary Nebula	23h 25m 54s	42d 32m 06s	8.6	32" x 28"	2,000 -> 4,000	0.35 -> 0.70
---	404	---	Mirach's Ghost	Dwarf Lenticular Galaxy	01h 09m 27s	35d 43m 04s	11.9	3.5'	10,000,000	100,000
---	7686	---	---	Open Cluster	23h 30m 07s	49d 08m 03s	5.6	15'	900	4
---	7640	---	---	Barred Spiral Galaxy	23h 22m 06s	40d 50m 44s	10.9	10.5' x 1.8'	26,000,000	80,000