

Messier 54 Globular Cluster in the constellation Sagittarius plus M55 - M69 - M70 and M75. With M8 - M17 - M18 - M20 - M21 - M22 - M23 - M25 - M28, which featured already in previous lectures.

Messier 54 (also known as M54 or NGC 6715) was discovered by **Charles Messier** in 1778 and subsequently included in his catalogue of comet-like objects.

OBSERVATION DATA (J2000 EPOCH)

Class III, in Constellation Sagittarius

Right ascension 18h 55m 03.33s

Declination $-30^{\circ} 28' 47.5''$

Distance 87.4 kly (26.8 kpc)

Apparent magnitude (V) 8.37

Apparent dimensions (V) 12'.0



Previously thought to belong to the Milky Way at a distance from Earth of about 50,000 light-years, it was discovered in 1994 that M54 most likely belongs to the Sagittarius Dwarf Elliptical Galaxy making it the first globular cluster formerly thought to be part of our galaxy reassigned to extragalactic status, even if not recognized as such for nearly two and a quarter centuries.

Modern estimates now place M54 at a distance of some 87,000 light-years, translating into a true radius of 150 light-years across. It is one of the denser of the globulars, being of class III (I being densest and XII being the least dense). It shines with the luminosity of roughly 850,000 times that of the Sun and has an absolute magnitude of -10.0.

As it is located at Sagittarius' centre, some authors think it actually may be its core; however others have proposed that it is a real globular cluster that fell to the center of this galaxy due to decay of its orbit caused by dynamical friction.

M54 is easily found in the teapot asterism. It is, however, not resolvable into individual stars even with larger amateur telescopes.

In July 2009, a team of astronomers reported that they had found evidence of an intermediate-mass black hole in the core of M54.

Messier 55, also known as M55 or NGC 6809) is a globular cluster, also known as the Summer Rose Star, is a globular cluster located in the constellation Sagittarius. It was discovered by **Nicolas Louis de Lacaille** in June 16, 1752 while observing from what today is South Africa. Starting in 1754, Charles Messier made several attempts to find this object from Paris, France, but the low declination meant it never rose sufficiently far above the horizon to allow for easy observation. He finally observed and catalogued it in 1778. Resolving the individual stars requires a medium-sized telescope.



Messier 69 (also known as M69 or NGC 6637) is a globular cluster in the constellation Sagittarius. It was discovered by Charles Messier on August 31, 1780, the same night he discovered M70. At the time, he was searching for an object described by Nicolas-Louis de Lacaille in 1751–2 and thought he had rediscovered it, but it is unclear if Nicolas-Louis de Lacaille actually described M69.



Messier 70, also a globular Cluster, is a close neighbour of M69, with 1,800 light-years separating the two objects. Both are in the Teapot of the constellation Sagittarius. It was discovered by Charles Messier in 1780. M70 is at a distance of about 29,300 light years away from Earth and close to the Galactic Centre. Only two variable stars are known within this cluster.

Messier 75 (also known as M75 or NGC 6864) is a globular cluster in the constellation Sagittarius. It was discovered by **Pierre Méchain** in 1780 and included in Charles Messier's catalogue of comet-like objects that same year. It is at a distance of about 67,500 light years and its apparent size is a radius of 67 light years. It is classified as class I, meaning it is one of the more densely concentrated globular clusters known.



Sagittarius is one of the constellations of the zodiac. It is one of the 48 constellations listed by the 2nd-century astronomer **Ptolemy** and remains one of the 88 modern constellations. Its name is Latin for the archer, and its symbol is a stylized arrow. Sagittarius is commonly represented as a centaur pulling-back a bow. It lies between Scorpius and Ophiuchus to the west and Capricornus and Microscopium to the east.

The center of the Milky Way lies in the westernmost part of Sagittarius.

The "Teapot" asterism is in Sagittarius. The Milky Way is the "steam" coming from the spout.

As seen from the northern hemisphere, the constellation's brighter stars form an easily recognizable asterism known as 'the Teapot'. The stars Kaus Media, Kaus Australis, Ascella, form the body of the pot; Kaus Borealis is the point of the lid; Alnasl is the tip of the spout; and Nunki and Tau Sgr the handle. These same stars originally formed the bow and arrow of Sagittarius. Marking the bottom of the teapot's "handle" (or the shoulder area of the archer), are the bright star Zeta Sagittarii, named Ascella, and the fainter Tau Sagittarii.

To complete the teapot metaphor, under good conditions, a particularly dense area of the Milky Way can be seen rising in a north-westerly arc above the spout, like a puff of steam rising from a boiling kettle.

The constellation as a whole is often depicted as having the rough appearance of a stick-figure archer drawing its bow, with the fainter stars providing the outline of the horse's body. Sagittarius famously points its arrow at the heart of Scorpius, represented by the reddish star Antares, as the two constellations race around the sky. Following the direct line formed by Delta Sagittarii and Gamma2 Sagittarii leads nearly directly to Antares. Fittingly, Gamma2 Sagittarii is Alnasl, the Arabic word for "arrowhead", and Delta Sagittarii is called Kaus Media, the "center of the bow," from which the arrow protrudes. Kaus Media bisects Lambda Sagittarii and Epsilon Sagittarii, whose names Kaus Borealis and Kaus Australis refer to the northern and southern portions of the bow, respectively.

In Greek mythology, Sagittarius is usually identified as a centaur: half human, half horse. However, perhaps due to the Greeks' adoption of the Sumerian constellation, some confusion surrounds the identity of the archer. Some identify Sagittarius as the centaur Chiron, the son of Philyra and Cronus, who was said to have changed himself into a horse to escape his jealous wife, Rhea, and tutor to Jason. As there are two centaurs in the sky, some identify Chiron with the other constellation, known as Centaurus. Or, as an alternative tradition holds, that Chiron devised the constellations Sagittarius and Centaurus to help guide the Argonauts in their quest for the Golden Fleece.

A competing mythological tradition, as espoused by Eratosthenes, identified the Archer not as a centaur but as the satyr Crotus, son of Pan, who Greeks credited with the invention of archery. According to the myth, Crotus often went hunting on horseback and lived among the Muses, who requested that Zeus place him in the sky, where he is seen demonstrating archery. The arrow of this constellation points towards the star Antares, the "heart of the scorpion", and Sagittarius stands poised to attack should Scorpius ever attack the nearby Hercules, or to avenge Scorpius's slaying of Orion.

