

## Messier 51 the Whirlpool Galaxy, M63 - M94 - M106 - M3

The Whirlpool Galaxy, also known as Messier 51a, M51a, and NGC 5194, is an interacting grand-design spiral galaxy with a Seyfert 2 active galactic nucleus. It lies in the constellation Canes Venatici, and was the first galaxy to be classified as a spiral galaxy. Its distance is estimated to be between 15 and 35 million light-years.

Whirlpool Galaxy (M51A or NGC 5194). The smaller object in the upper right is M51B or NGC 5195.

### OBSERVATION DATA

Constellation Canes Venatici

Right ascension 13h 29m 52.7s

Declination +47° 11' 43"

Redshift 0.001544

Distance 23 Mly ( $7.1 \pm 1.2$  Mpc)

Apparent magnitude (V) 8.4

What later became known as the Whirlpool Galaxy was discovered on October 13, 1773, by **Charles Messier** while hunting for objects that could confuse comet hunters, and was designated in Messier's catalogue as M51. Its companion galaxy, NGC 5195, was discovered in 1781 by **Pierre Méchain**, although it was not known whether it was interacting or merely another galaxy passing at a distance. In 1845, **William Parsons**, 3rd Earl of Rosse, employing a 72-inch (1.8 m) reflecting telescope at Birr Castle, Ireland, found the Whirlpool possessed a spiral structure, the first "nebula" to be known to have one. These "spiral nebulae" were not recognized as galaxies until **Edwin Hubble** was able to observe Cepheid variables in some of these spiral nebulae, which provided evidence that they were so far away that they must be entirely separate galaxies even though they are seen close together.

The advent of radio astronomy and subsequent radio images of M51 unequivocally demonstrated that the Whirlpool and its companion galaxy are indeed interacting. Sometimes the designation M51 is used to refer to the pair of galaxies, in which case the individual galaxies may be referred to as M51a (NGC 5194) and M51b (NGC 5195).

**M51 is visible through binoculars under dark sky conditions, and it can be resolved in detail with modern amateur telescopes. Under dark skies, and with a moderate eyepiece through a 150 mm telescope, M51's intrinsic spiral structure can be detected. With larger (>300 mm) instruments under dark sky conditions, the various spiral bands are apparent with HII regions visible, and M51 can be seen to be attached to M51B.**

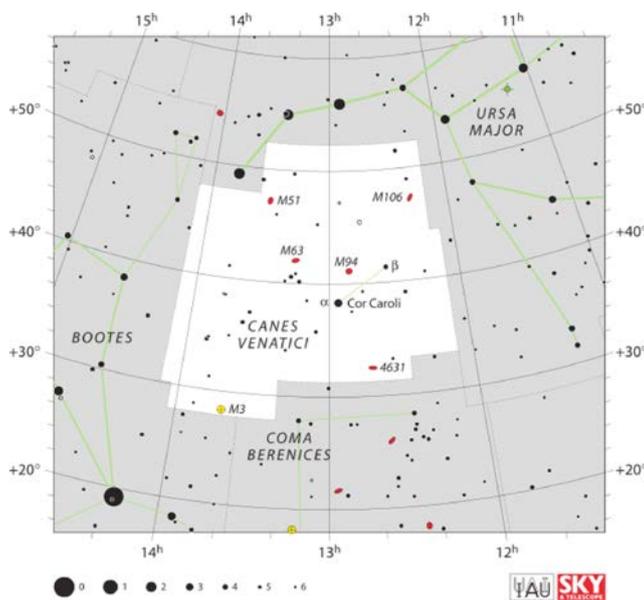
**Overall the galaxy is about 25–33% the size of the Milky Way. Its mass is estimated to be 160 billion solar masses. The pronounced spiral structure of the Whirlpool Galaxy is believed to be the result of the close interaction between it and its companion galaxy NGC 5195, which may have passed through the main disk of M51 about 500 to 600 million years ago.**

Three supernovae have been observed in the Whirlpool Galaxy. In 1994, SN 1994I was observed in the Whirlpool Galaxy. It was classified as type Ic, indicating that its progenitor star was very massive. In June 2005 the type II supernova SN 2005cs was observed peaking at apparent magnitude 14. On 31 May 2011 a type II supernova was detected, peaking at magnitude 12.1. Together, the two galaxies are the most widely studied interacting galaxy pairs.

The Whirlpool Galaxy is the brightest galaxy in the small group of galaxies that also includes M63 (the Sunflower Galaxy), NGC 5023, and NGC 5229. This group may actually be part of an elongated group that includes the M106 Group and the NGC 5866 Group, although most identification methods and catalogues identify the three groups as separate entities.



The galaxy and its companion, NGC 5195, are easily observed by amateur astronomers, and the two galaxies may be seen with binoculars. It has been extensively observed by professional astronomers, who study it to understand galaxy structure



Canes Venaticids - Bordering constellations are Ursa Major, Boötes and Coma Berenices

## CANES VENATICI

Canes Venatici is one of the 88 official modern constellations. It is a small northern constellation that was created by **Johannes Hevelius** in the 17th century. Its name is Latin for "hunting dogs", and the constellation is often depicted in illustrations as representing the dogs of Boötes the Herdsman, a neighbouring constellation. Cor Caroli is the constellation's brightest star, with an apparent magnitude of 2.9. La Superba is one of the reddest stars in the sky and one of the brightest carbon stars. **The Whirlpool Galaxy is a spiral galaxy tilted face-on to observers on Earth, and was the first galaxy whose spiral nature was discerned.**



Canes Venatici can be seen in the orientation they appear to the eyes in this 1825 star chart from Urania's Mirror

In 1533, the German astronomer **Peter Apian** depicted Boötes as having two dogs with him. These spurious dogs floated about the astronomical literature until Hevelius decided to specify their presence in the sky by making them a separate constellation in 1687. Canes Venatici contains no bright stars, Alpha and Beta Canum Venaticorum being only of 3rd and 4th magnitude respectively. Alpha Canum Venaticorum, also known as Cor Caroli ("heart of Charles"), is the constellation's brightest star, named by **Sir Charles Scarborough** in memory of King Charles I, the deposed king of Britain. R Canum Venaticorum is a Mira variable that ranges between magnitudes 6.5 and 12.9 over a period of approximately 329 days.

**The Giant Void, an extremely large void (part of the universe containing very few galaxies) is within the vicinity of this constellation. It may be possibly the largest void ever discovered, slightly larger than the Eridanus Supervoid and 1,200 times the volume of expected typical voids. It was discovered in 1988 in a deep-sky survey.**

Canes Venatici contains five Messier objects, including four galaxies. One of the more significant galaxies is the Whirlpool Galaxy (M51, NGC 5194) and NGC 5195, a small barred spiral galaxy that is seen face on. This was the first galaxy recognised as having a spiral structure, this structure being first observed by **Lord Rosse** in 1845. It is a face-on spiral galaxy 37 million light-years from Earth. Widely considered to be one of the most beautiful galaxies visible, M51 has many star-forming regions and nebulae in its arms, colouring them pink and blue in contrast to the older yellow core.

**Other notable spiral galaxies in Canes Venatici are the Sunflower Galaxy (M63, NGC 5055), M94 (NGC 4736), M106 (NGC 4258) and M3.**

**M63, the Sunflower Galaxy, was named for its appearance in large amateur telescopes. It is a spiral galaxy with an integrated magnitude of 9.0.** It is a spiral galaxy consisting of a central disc surrounded by many short spiral arm segments, the galaxy form known as flocculent. It is an active galaxy with a LINER nucleus and part of the M51 Group. The existence of a super massive black hole (SMBH) at the nucleus is uncertain; if it does exist, then the mass is estimated as  $8.5 \times 10^8 M_{\odot}$ .

M63 was discovered by Pierre Méchain on June 14, 1779. The galaxy was then listed by Charles Messier as object 63 in the Messier Catalogue. In the mid-19th century, Lord

Rosse identified spiral structures within the galaxy, making this one of the first galaxies in which such structure was identified. In 1971, a supernova with a magnitude of 11.8 appeared in one of the arms.

**M94 is a small face-on spiral galaxy with an approximate magnitude of 8.0, about 15 million light-years from Earth.**

**M3 (NGC 5272) is a globular cluster 32,000 light-years from Earth. It is 18' in diameter, and at magnitude 6.3 is bright enough to be seen with binoculars and even with the naked eyes.**

**Messier 106 is an intermediate spiral galaxy, also discovered by Pierre Méchain in 1781. It is at a distance of about 22 to 25 million light-years and contains an active nucleus classified as a Type 2 Seyfert.**

