MESSIER 32 DWARF ELLIPTICAL GALAXY

M32 (also known as NGC 221) is a dwarf elliptical galaxy located about 2.65 million light-years from Earth, appearing in the constellation Andromeda. It is a satellite galaxy of the Andromeda Galaxy (M31) and was discovered by **Guillaume Le Gentil** in 1749. M32 measures 6.5 ± 0.2 thousand light-years in diameter at the widest point.

The galaxy is a prototype of the Compact Elliptical Galaxy class. Half the stars concentrate within an effective radius of only 100 parsecs. Densities in the central stellar cusp increase steeply, exceeding 3×107 M⊙ at the smallest radii resolved by HST. Like more ordinary elliptical galaxies, M32 contains mostly older faint red and yellow stars with practically no dust or gas and consequently no current star formation. It does, however, show hints of star formation in the relatively recent past.

OBSERVATION DATA (J2000 epoch)
Constellation Andromeda
Right ascension 00h 42m 41.8s
Declination +40° 51' 55"
Redshift -200 ± 6 km/s
Distance 2.49 ± 0.08 million light-years
Apparent magnitude (V) 8.08
CHARACTERISTICS
Type cE2
Apparent size (V) 8'.7 × 6'.5
Notable features - satellite galaxy of the Andromeda Galaxy

In this image of the Andromeda Galaxy, Messier 32 is to the left of the centre.

The structure and stellar content of M32 are difficult to explain by traditional galaxy formation models. Theoretical arguments and some simulations suggest a scenario in which the strong tidal field of M31 can transform a spiral galaxy into a compact elliptical. As a small spiral galaxy falls into the central parts of M31, most of the outer layers of the smaller spiral are stripped away. The central bulge of the galaxy is much less affected and retains its morphology. **Tidal effects trigger a massive star burst in the core, resulting in the high density of M32 observed today. There is also evidence that M32 has an outer disk.**

Newer simulations find that an off-centre impact by M32 around 800 million years ago explains the present-day warp in M31's disk. However this feature only occurs during the first orbital passage, whereas it takes many orbits for tides to transform a normal dwarf into M32. The observed colours and stellar populations of M32's outskirts do not match the stellar halo of M31, indicating that tidal losses from M32 are not their source. Taken together, these circumstances may suggest that M32 already began in its compact state, and has retained most of its own stars. At least one similar cE galaxy has been discovered in isolation, without any massive companion to thresh it.

Two techniques have been used to measure distances to M32. The infrared surface brightness fluctuations distance measurement technique estimates distances to spiral galaxies based on the graininess of the appearance of their bulges. The distance measured to M32 using this technique is 2.46 ± 0.09 million light-years. However, M32 is close enough that the tip of the red giant branch (TRGB) method may be used to estimate its distance. The estimated distance to M32 using this technique is 2.51 ± 0.13 million light-years. **For several reasons M32 is thought to be in the foreground of M31, the Andromeda Galaxy, rather than behind. Its stars and planetary nebulae do not appear obscured or reddened by foreground gas or dust. Gravitational microlensing of M31 by a star in M32 was observed in one event.**

M32 is believed to contain a supermassive Black Hole. Its mass has been estimated to lie between 1.5 and 5 million solar masses. A centrally located faint radio and X-ray source (now named M32* in analogy to Sgr A*) is attributed to gas accretion onto the black hole.

AK with EarthSky and Wikipedia Noted