

## **ASSA DEEP SKY BULLETIN**

### **GALACTIC CANNIBALISM:**

#### **THE SAGITTARIUS DWARF SPHEROIDAL GALAXY (SagDEG) AND THE M54 (NGC 6715) GLOBULAR STAR CLUSTER**

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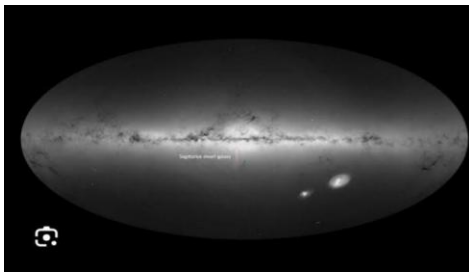
#### **A INTRODUCTION**

The Milky Way is devouring a nearby dwarf galaxy but not in plain sight. The dim glow of the Milky Way spreads through the constellation Sagittarius in the direction of the galactic centre, which lies beyond and is obscured from our view by dust and gas clouds. What no astronomer realized until 1994 was that this glow hid the presence of a dwarf spheroidal galaxy. Spreading over 10", the dwarf galaxy lies only 80'000 light years away on the other side of the Milky Way's centre. By comparison, the large Magellanic Cloud, previously thought to be the nearest galaxy to us, lies 170000 light years away from earth.

Normal dwarf spheroidal galaxies have a diameter of about a thousand light years, but the gravity of our galaxy has distorted the Sagittarius dwarf galaxy, stretching it out to about 10000 light years across. Astronomers believe the galaxy is moving away in a 15 billion-year-long orbit. Unfortunately, the galaxy's first encounter with the Milky Way may be its last. The dwarf galaxy is now so spread out that its gravity can't keep the stars together and they will eventually become incorporated into the Milky Way. At the heart of this doomed dwarf galaxy or maybe even its nucleus, lies the globular star cluster M54.

#### **B THE SAGITTARIUS DWARF SPHEROIDAL GALAXY (SagDEG) AND THE M54 (NGC 6715) GLOBULAR STAR CLUSTER**

##### **1 THE SAGITTARIUS DWARF SPHEROIDAL GALAXY (SagDEG)**

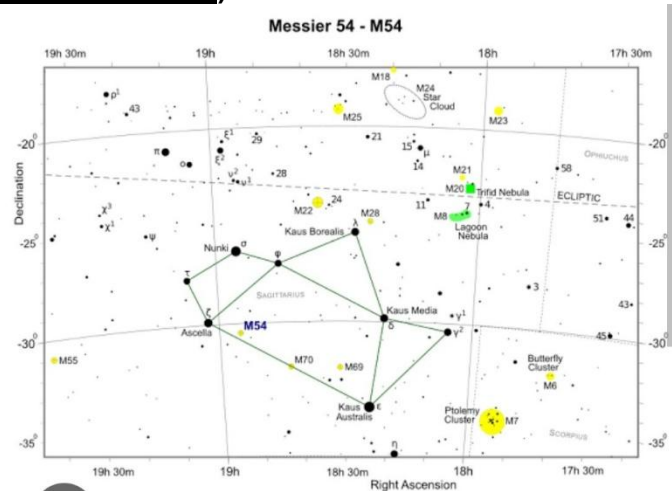


Discovered in 1994 by Rodrigo Ibata, Gerry Gilmore and Mike Irwin this faint galaxy is a satellite of the Milky Way and currently in the process of being

gravitationally a disrupted and assimilated, cannibalized if you will. Despite its proximity, it was overlooked for decades due to its position on the other side and behind the dense central bulge of our own galaxy.

Located 80000 light years from earth, the Sagittarius dwarf galaxy is on an elongated, polar orbit around the Milky Way, forming part of what astronomers now call the Sagittarius stream – an ongoing example of Galactic cannibalism.

## 2 **M54 (NGC 6715) GLOBULAR STAR CLUSTER**



At the heart of the abovementioned dwarf galaxy lies Messier 54 (NGC 6715), a spectacular globular star cluster that for centuries was thought to belong to the Milky Way. Discovered by Charles Messier in 1778, M54 is bright and compact (magnitude -7.6), located about 87000 light years from earth. It was only in 1994 that astronomers realized that M54 likely resides within the core of the Sagittarius dwarf galaxy, making it the first globular star cluster known to belong to another galaxy.

Spanning roughly 150 light years across, M54 contains hundreds of thousands of stars. Its metal content and stellar population differ from the Milky Way clusters, reflecting the distinct chemical evolution of its parent galaxy.

M54 may even host an intermediate-mass black hole at its centre, a rare possibility among globular clusters, hinting at a more complex and intriguing history.

## C **OBSERVATIONAL DATA FOR M54 (NGC 6715)**

Class: III

Constellation: Sagittarius

Right ascension: 18h 55m 03.33s

Declination: -30° 28' 47.5"

Distance: 87000 light years

Apparent magnitude: 7.6

Apparent dimensions: 12.0'

## **D**     **OBSERVING NOTES**

From June to August M54 is ideally placed for observation during the mostly clear winter months. Medium sized telescopes (6-8 inch) under dark skies will place M54 within reach as a bright condensed glow. Small telescopes will reveal M54 as a compact, misty patch of light while larger instruments (250mm/10 inch and above) will begin to resolve its outer stars. Pair your observation with nearby globulars such as M70 and M69 to compare concentration and brightness. The Sagittarius dwarf galaxy itself is not directly visible to amateur instruments – it's far too diffuse – but its presence is betrayed by M54 and the broader Sagittarius stream, which modern surveys are mapping in increasing detail.

## **E**     **ASTROPHYSICAL SIGNIFICANCE**

The Sagittarius dwarf galaxy and M54 offer a unique window into galactic interaction and stellar archaeology. They provide real time evidence of how the Milky Way grows by accreting smaller systems. M54's identification as an extra-galactic cluster marked a milestone in our understanding of the dynamic and cannibalistic nature of galaxy evolution. M54 is more massive than typical Milky Way globulars containing several hundred thousand stars and most likely has an intermediate mass black hole at its centre.

As the Milky Way continues to absorb the Sagittarius dwarf galaxy over the coming eons, M54 will eventually be just another globular star cluster in our galactic halo – its origins forgotten by all but the deepest sky observers and historians of the cosmos alike.

Clear skies and happy observing!

Colin Steyn

## **ACKNOWLEDGEMENTS**

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