Is M85 missing a black hole?

October 17 2011, By Jon Voisey

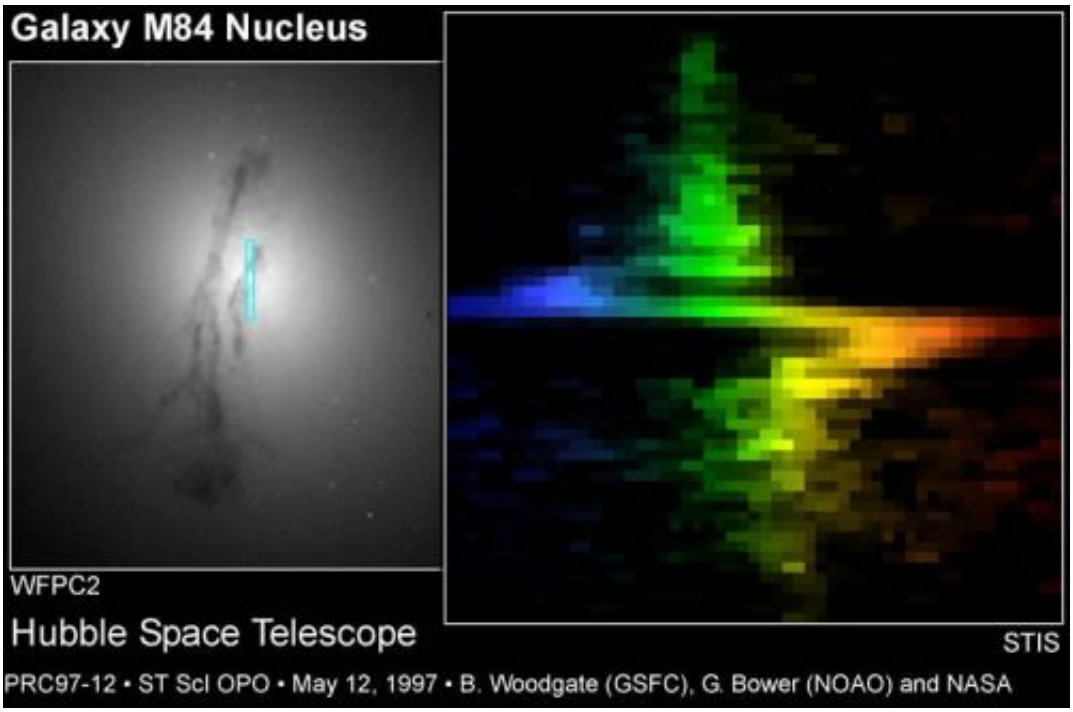
Galaxy M85. Image credit: NOAO/AURA/NSF

The conventional wisdom of galaxies is that they should have a central massive black hole (CMBH). The presence of such objects has been confirmed in our own galaxy as well as numerous other galaxies, including the Andromeda galaxy (M31) and even some dwarf galaxies. The mass of these objects, several million times the mass of the Sun, has

been found to be related to many properties of galaxies as a whole, indicating that their presence may be critical in the formation and evolution of galaxies as a whole. As such, finding a massive galaxy without a central black hole would be quite surprising. Yet a recent study by astronomers from the University of Michigan Ann Arbor seems to have found an exception: The well known M85.

To determine the mass of the CMBH, the team used the spectrograph on board the Hubble Space Telescope to examine the pull the central object had on stars in the nearby vicinity. The higher this mass is, the more quickly the stars should orbit. This orbital velocity is detected as a shift in the color of the light, blue as the stars move towards us, red as they move away. The amount the light is shifted is dependent on just how fast they move.

This technique has been used previously in other galaxies, including another large elliptical of similar brightness in the Messier catalog, M84. This galaxy had its CMBH probed by Hubble in 1997 and was determined to have a mass of 300 million solar masses.



Doppler shift of gas and dust caused by M84's supermassive black hole. Image Credit: Gary Bower, Richard Green (NOAO), the STIS Instrument Definition Team, and NASA

When this method was applied to M85 the team did not discover a shift that would be indicative of a black hole with a mass expected for a galaxy of such size. Using another, indirect method of determining the CMBH mass by looking at the the amount of overall light from the galaxy, which is generally correlated with black hole mass, would indicate that M85 should contain a black hole of 300 million to 2 billion solar masses. Yet this study indicates that, if M85 contains a central black hole at all, the upper limit for the black hole would be around 65 million solar masses.

This study is not the first to report a non-detection for the galaxy, a 2009 study led by Alessandro Capetti from Osservatorio Astronoimco di Torino in Italy, searched M85 for signs of radio emission from the black

hole region. Their study was unable to detect any significant radio waves from the core which, if M85 had a significant black hole, should be present, even with a small amount of gas feeding into the core.

Overall, these studies demonstrate a significant shortcoming in secondary methods of black hole mass estimation. Such indirect methods have been previously used with confidence and have even been the basis for studies drawing the connection between galaxy evolution and black hole mass. If cases like M85 are more common that previously thought, it may prompt astronomers to rethink just how connected black holes and a galaxies properties really are.

Source: Universe Today