The Universe: It's not as violent as we think

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These two galaxies will pass by each other this time, but millions of years from now they will collide to form a much larger galaxy. ANU astronomer Dr Alister Graham has shown there are far fewer galactic collisions than past observations have led us to believe. Photo: courtesy NASA and Hubble Heritage Team (STScI).

The Universe has experienced far fewer collisions among galaxies than previously thought, according to a new analysis of Hubble Space Telescope data by an ANU researcher. Astronomer Dr Alister Graham, from the Research School of Astronomy and Astrophysics, analysed a sample of galaxies located 100 million light years away — and discovered that the number of violent encounters between large galaxies is around one-tenth of the number earlier studies had suggested. Although theoretical models predict that fewer collisions were involved in the evolution of the universe, Dr Graham's observations are the first that confirm these theories.

"The new result is in perfect agreement with popular models of

hierarchical structure formation in our universe," Dr Graham said. "Galactically speaking, things appear to be a little safer out there."

For years, astronomers have known the collision and merger of galaxies resulted in the formation of larger galaxies. The biggest of these galaxies appear largely devoid of stars at their cores, a phenomenon believed to result from the damage caused by the 'supermassive' black holes from the smaller galaxies as they merge near the centre of the new galaxy.

However, rather than requiring multiple mergers to clear away the stars from the heart of a galaxy, Dr Graham has shown just one collision between two galaxies is sufficient.

Using images from Hubble's Wide Field Planetary Camera 2, Dr Graham was able to examine galaxies 100 million light years away, whose cores had not been depleted of stars, providing an important insight into star distributions before any major collisions occurred. By considering the overall galaxy structure, he was able to more accurately measure the sizes of the depleted cores in the galaxies.

The result: the mass of the deficit of stars at the galaxies centres equalled rather than exceeded the mass of the black hole.

"If there had been 10 mergers, we would have found a star deficit 10 times the mass of the central black hole. Many galaxies have large central black holes but no depleted cores. It is therefore not the case that every black hole is formed by gobbling up its surrounding stars. Instead, we're observing the demolished cores of galaxies after the union of two massive cosmic wrecking balls."

Although small satellite galaxies have been captured by our galaxy, the Milky Way, it has not experienced a recent major merger. If it had, the plane of its disk, visible as a faint wide ribbon in the night sky, would

have been scattered and dispersed across the heavens. Such a fate is expected in about three billion years when the Milky Way collides with a neighbouring spiral galaxy, Andromeda.

The research was conducted during Dr Graham's tenure at the University of Florida and was funded by NASA via a grant from the Space Telescope Science Institute in Baltimore. Dr Graham's research will appear in the September 20 edition of Astrophysical Journal Letters.

Source: The Australian National University