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CANNIBAL GALAXIES

Ken Tapping, 17th March, 2015

It was not long ago that we thought that our galaxy, the Milky Way, was the entire universe. Those spiral things our telescopes were showing us were explained as stars and planetary systems in the process of forming. Then, as observations accumulated, we had to accept that those spirals are other galaxies, and ours is just one among billions. For a while afterward other galaxies were referred to, poetically, as “Island Universes”. The term conjures up the wonderful image of huge spirals of stars, planets, gas and dust, floating sedately in the void. In hindsight we really had no reason to think that. All the bodies we see in space are due to smaller things colliding to make bigger things or big things being smashed back into smaller things. This applies to stars, planets and smaller bodies; why shouldn't it apply to galaxies too? Actually it does. Galaxies usually occur in clusters. Ours is a member of the “Local Group”, which has about 30 members. The varying mutual gravitational attraction between the members of a cluster as they move around means all their orbits are constantly changing. From time to time two galaxies will be thrown onto a collision course.

Individual galaxies come in three types: classical spirals, like the galaxy in Andromeda and our galaxy, elliptical galaxies – round blobs of stars, and irregular galaxies, which have no particular shape. However, as telescopes improved, the images got better and the collection of observations built up, things became more dramatic. We found pairs of galaxies looking like two tadpoles dancing closely together, being pulled out of shape by their neighbours, and even galaxies colliding and tearing each other apart.

Galaxy collisions are not like planet collisions, which are dramatic, very destructive, and not good things to be anywhere near. Galaxies are mostly empty space with very rarified clouds of gas and dust. Even the densest places in those clouds are a better vacuum than we can achieve in the laboratory. There are billions of stars, but galaxies

are so big that on average stars are huge distances apart. The whole structure is held together by gravity. For these huge, fuzzy structures, collisions are not impacts, more a complicated interaction and assimilation.

Imagine two spiral galaxies approaching each other. Initially the gravitational attraction holding each galaxy together is far stronger than their gravitational pull on each other. As they get closer this ceases to be the case. The outer material and stars start to be pulled out of their orbits round the centre of their particular galaxy. We see the spiral starting to be distorted. Eventually they start tearing each other apart. If one galaxy is much bigger than the other, the smaller one is just cannibalized and the big one gets a bit bigger. If the two galaxies are roughly the same size things can be more spectacular. Eventually the galaxies meet and because they are mostly empty space, they pass into and through each other. Stars and clouds of dust and gas will go flying off in all directions. However there are few if any collisions between stars and any planetary systems will probably be unscathed. In the end the result will be a new and bigger galaxy and maybe some blobs thrown off at too high a speed to come back. However the collisions between the gas and dust clouds may trigger a wave of cloud collapses and the birth of new stars and planets. It is likely that all moderately large galaxies like ours grew by assimilating their smaller neighbours. Our next collision will be in about 4 billion years, when we will run head-on into the Andromeda Galaxy, at about 110 km/sec. As that galaxy is twice the size of ours, the event should be quite a spectacle.

Venus continues to shine brilliantly in the western sky after sunset. Mars is getting lost in the glare. Jupiter dominates the southern sky overnight. Saturn rises about 2am. On the 20th the Moon will be New, and there will be a total solar eclipse, but it will not be visible from North America.

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