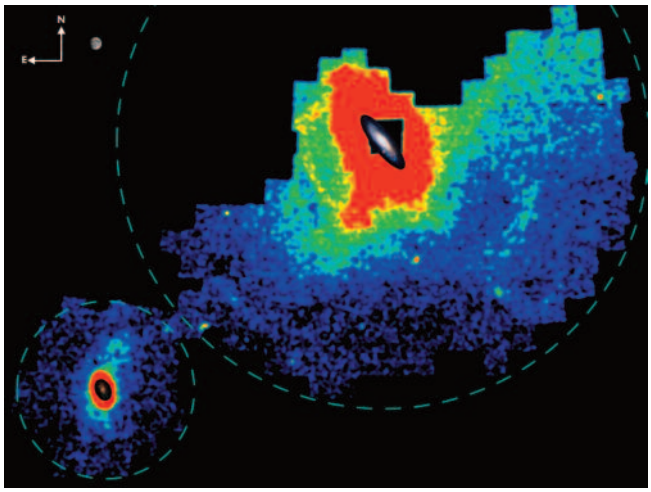
Galaxies in Collision

Our nearest large neighbouring galaxy, Andromeda, has been interacting with the smaller Triangulum Galaxy, with a trail of stars between them adding weight to theories of galaxy formation.



Streams of stars, dwarf galaxies and a distortion around the disk of the smaller Triangulum galaxy provide evidence that it is strongly interacting with the larger Andromeda galaxy. Image: T. A. Rector and M. Hanna

University of Sydney astronomer Prof Geraint Lewis was part of an international team to study the two galaxies and the space between. Their work is further evidence for the now-dominant "hierarchical model" of galaxy formation, where large galaxies are believed to have formed by combining and absorbing smaller ones.

"The overall model of galaxy formation is slightly messy," Lewis says. "In some areas there were collapses to give big objects to start with, but we have inferred from red shifts that many galaxies formed hierarchically, and we can now see this in our own backyard.

"The Andromeda Galaxy is our closest giant neighbour, located more than 2.5 million light years from the Milky Way. Our new survey charts an area with a diameter of nearly a million light years centered around Andromeda. It's the broadest and deepest image of a galaxy ever made," Lewis says.

"We mapped Andromeda's unexplored outskirts for the first time and found stars and giant structures that are remnants of smaller galaxies, which have been incorporated into Andromeda as part of its ongoing growth." This includes stars stripped from Triangulum's outer reaches during a previous close approach.

Lewis suspects that even more damage may be done the next time that the Triangulum gets to the closest point in its orbit around its larger neighbour. "It may lose the beautiful spiral disk structure that defines it," he says.

The transfer from one galaxy to another, or even wholesale absorption, will not particularly affect individual stars. "Galaxies are mostly empty, so a planet orbiting a star will keep on orbiting that star," Lewis says.

However, the night sky may change for any observers. Galactic collisions bring clouds of gas from each galaxy into contact, setting up shockwaves that trigger huge bursts of star formation.

Studies of hydrogen gas had previously detected streams pulled between the two galaxies, but Lewis says this is the first sign of stars similarly affected. Lewis says the old photographic plates lacked the resolution to pick up individual stars at such great distances, but that CCD cameras on the Canada–France–Hawaii Telescope had the resolution required. Nevertheless Lewis says that the finding created surprise because "the Triangulum's disk looks so quiescent and undisturbed".

The finding follows evidence that our own Milky Way galaxy is cannibalising its neighbours, including the Magellanic Clouds (*AS*, September1998, p.5; July 2008, p.43).

All of this is just a preview for the ultimate collision in our area of the universe, when Andromeda and the Milky Way come together around three billion years from now. "Andromeda is approaching us at 500 km an hour," Lewis says. "We know it's coming. The question is how direct the hit will be, which depends on its motion across the sky, which in turn is hard to measure."