

ASTRONOMY

Galaxies appear peaceful only from afar, X-ray images show

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A delicate pinwheel turns with cosmic grace and silent grandeur, floating in the depths of intergalactic space.

A galaxy is nature's greatest kinetic sculpture. It's a collection of a hundred billion stars a billion billion miles across.

Our sun, and the planets that orbit it, are part of the galaxy that we call the Milky Way. The Milky Way's bigger brother, the galaxy M31 in Andromeda, is well known to backyard stargazers as the most distant object visible to the naked eye.

Andromeda and the Milky Way are spirals or disk galaxies. Their stars are spread out in pancakelike patterns and orbit the galaxies' centers like horses on a merry-go-round.

Other galaxies are not so flat. Elliptical galaxies dominate the more-crowded parts of the universe. Their stars swing around wildly like a swarm of gnats.

Photographs of elliptical galaxies give the impression that they are cool, quiet islands of light in the sea of space. But no galaxy is an island. And ellipticals are definitely not quiet places.

In the past few decades, we have learned to see the universe in many colors: not just visible colors such as red and blue, but colors invisible to human eyes, such as ultraviolet, radio waves and X-rays.

The Chandra X-ray Observatory, in orbit above the Earth, lets us see the hot gas between the stars. This gas is heated to at least a million degrees and emits X-rays. With Chandra, we are beginning to see how stormy some galaxies are.

Down on the ground in Athens, in southeastern Ohio, we are using Chandra to study the hot gas in elliptical galaxies. We are seeing that these galaxies are almost never peaceful, which surprised us. The gas is being continuously stirred up, perpetually hot and bothered.

What is responsible? Observations with radio telescopes suggest that the culprit is the massive black hole that lives at the center of every big galaxy. These black holes shoot out blobs of high-energy gas that shove their way out of the galaxy like rude subway riders getting off a train.

We're seeing more and more evidence that black holes might have played a key role in making our universe what it is today. In the grand scheme of things, black holes might be small, but their reach can be very long.

You can see some of Chandra's X-ray images of stirred-up galaxies at chandra.harvard.edu/press/06_releases/press_011006.html.

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