

Facilitator Information

(All you need to know about galaxies to survive the day)

What is a galaxy?

Galaxies are large collections of stars and gas and dust. They have millions to billions of stars, all held into a cluster by gravitational attraction. Most galaxies are flat, but there are different shapes — some are spirals, some are elliptical, and some are irregular.

Our Galaxy

The **Milky Way** is a galaxy, a slowly rotating cluster of more than 200,000,000,000 stars! Our Milky Way Galaxy looks a little like a pinwheel. It is a spiral galaxy, about 100,000 light years across. Spiral galaxies have: a bulge in the center (called the nuclear bulge) that contains the nucleus; a wide, flat disk with distinct spiral arms containing stars; and a surrounding halo of stars. There are several “spiral arms” in our Milky Way: Sagittarius, Cygnus, Perseus, and Orion.

Where are we in the Milky Way Galaxy?

We are in one of the **spiral arms**, about 30,000 light years from the center of the Milky Way Galaxy — or about two-thirds of the way from the center.

Can you see the Milky Way?

Yes! On a very dark night, away from bright lights, you can see a faint, hazy — or milky — band in the sky. This is the Milky Way. The hazy appearance is because there are so many stars that are very distant; your eye cannot distinguish the stars as separate points of light. By using binoculars or a telescope, you can see the individual stars. The Milky Way is like a big, flat disk in space. We are looking into the wide part of the disk when we look at the band across the sky. All of the stars that we see with our naked eyes — approximately 6000 — are part of our Milky Way Galaxy.

Where did our galaxy come from?

Our galaxy is believed to have formed from an immense, churning, slowly rotating, cloud of dust and hydrogen and helium gas that was perhaps 300,000 light years across. Gradually, the cloud began to collapse, becoming more dense in the center. Pockets of more dense material formed in swirling portions. These became dense enough to be sites of early star formation, distributed throughout the cloud — the stars and clusters of the galaxy's halo. The early stars formed from the hydrogen and helium. As they aged, they evolved and created new, heavier, more metallic elements. When these stars eventually exploded in huge supernovas, they released the heavier elements back to the cloud.

As the rotating cloud collapsed further, it began to flatten into a slowly spinning disk. More and more stars formed from the dust and gas enriched in the heavier elements. These are the metal-rich stars in our galaxy's center bulge and scattered

throughout its disk. Stars still are forming, evolving, and dying, each contributing to the gas and dust within our galaxy — each contributing to the formation of other stars.

Are there other galaxies?

Yes! There are billions of other galaxies in our universe. We can even see a few, including the Andromeda Galaxy, and (from the southern hemisphere) the Large and Small Magellanic Clouds.

Galaxies are organized into clusters. Our Milky Way Galaxy is part of a Local Group, a cluster of about 35 galaxies, including the larger Andromeda Galaxy, which is about 3 million light years away. There are other clusters of galaxies, and the clusters can be grouped into clusters of clusters — superclusters. The Local Supercluster is about 100 million light years across, and contains our Local Group and the Virgo cluster.