

MORE ON THE MILKY WAY

How can you take a picture of our Galaxy if we are in it? Since our Solar System is embedded within our Galaxy, we can only show an artist's representation of what it looks like from the outside. From our vantage point, we only have an edge-on view of the Milky Way, but this is still very useful. Different types of astronomical observations — some that trace the spiral arms, others that detect stars or gas and dust — can be pieced together. Combined with images from other galaxies that are the same type as ours, this allows scientists to construct a view of what the Milky Way would look like from the outside.

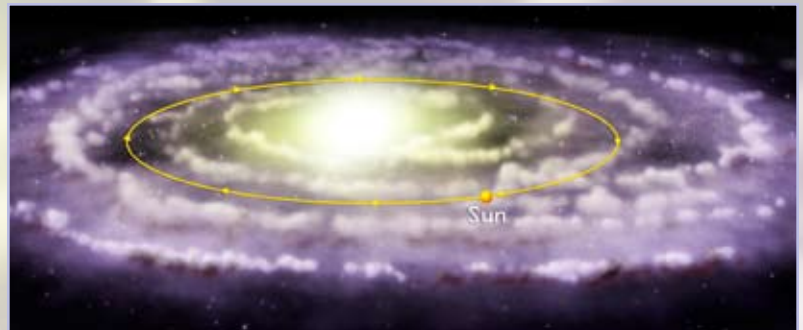
How far are we from the Galactic plane and the center of the Galaxy? The Earth is a few tens of light years above the middle of the thin disk where most of the stars in the Galaxy are found, also known as the “Galactic plane.” This is actually rather close given the scale of the Galaxy. On the other hand, the Earth is approximately, 25,000 light years away from the center of the Galaxy. To put this into context, that places us in a spiral arm about 2/3 of the way to outer edge of the Galaxy.



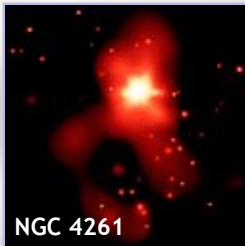
How do we know there's a supermassive black hole in the center of the Milky Way? Astronomers have used careful observations of the motions of stars around the center of our Galaxy to make inferences about the mass of the object that lies at the center. They have concluded that these stars orbit a dark massive body, with a mass approximately 3 million times that of the Sun. The only known object that could be so massive and still be dark is a supermassive black hole.

Could a black hole in our Galaxy ever be strong enough to pull our solar system into it? It would have to be so close that its gravity could overcome the orbital acceleration of our solar system around the center of the Galaxy. That would be well within a light year, even for a million solar mass black hole, which we would definitely know about!

Is our solar system traveling within our Galaxy? Our solar system travels in an orbit around the center of the Galaxy at a velocity (i.e. speed) of a few hundred kilometers per second, completing one orbit around the center of the Milky Way about every 230 million years. In addition, the solar system is moving at about 20 kilometers per second with respect to the nearby stars. There is also a small amount of motion with respect to the plane of the Galaxy. Currently, the solar system is heading outwards but the gravitational pull of the stars in the galactic plane will eventually cause it to stop and then move back towards the galactic plane. Our whole Galaxy is also traveling through space. Within the local group of galaxies, the Milky Way's velocity is several hundred kilometers per second.



The Antennae



NGC 4261

What would happen if the Andromeda Galaxy and the Milky Way galaxy collided?

This collision won't happen for several billion years, but if it does, enormous numbers of new stars should form, as gas from the two galaxies is squeezed together. Large numbers of massive stars should explode as supernovas, spreading heavy elements like iron and magnesium outwards. An example of this effect can be seen in the Antennae galaxies. Chandra observations (left) of these colliding galaxies have revealed hot gas containing extremely high concentrations of heavy elements. These elements were created by nuclear fusion reactions in the centers of massive stars,

and were dispersed by supernova explosions. The motions of the stars in the original spiral galaxies are radically changed by a galactic collision, and eventually a large elliptical galaxy should form. This process is believed to have taken place a few billion years ago in NGC 4261. This large elliptical galaxy shows no trace of its violent history in optical images, but Chandra observations (right) are thought to show remnants of a galactic collision.

MORE INFORMATION ON THE MILKY WAY IS AVAILABLE AT

http://chandra.harvard.edu/xray_sources/milky_way.html

<http://chandra.harvard.edu/photo/category/milkyway.html>

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