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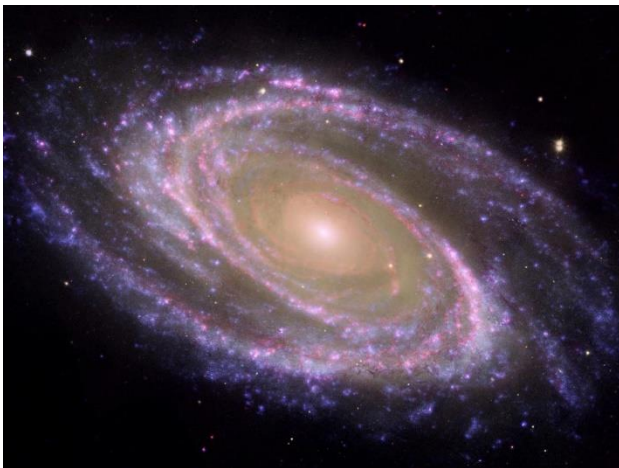
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What Is Our Galaxy All About?

Ten Things You Don't Know About The Milky Way Galaxy



So you have lived here all your life — in fact, everyone has — but what do you really know about the Milky Way galaxy? Sure, you know it is a spiral, and it is 100,000 light years across.

So let's see if these really are ten things you don't know about the Milky Way Galaxy.

1) It is a barred spiral.

You might know that the Milky Way is a spiral galaxy, perhaps the most beautiful galaxy type. The majestic arms sweeping out from a central hub or bulge of glowing stars. That's us. But a lot of

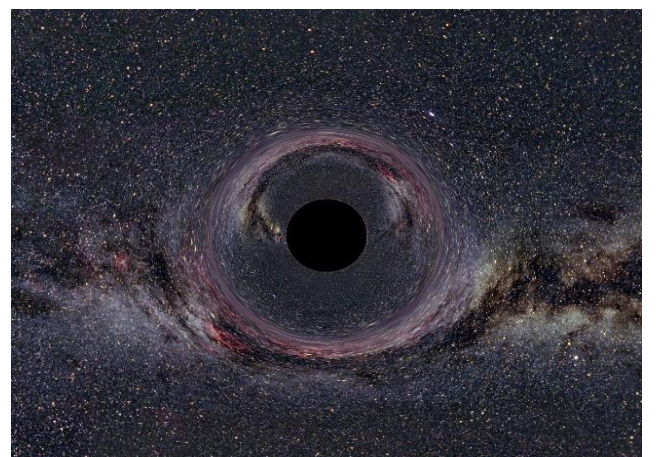
spirals have a weird feature: a rectangular block of stars at the center instead of a sphere, and the arms radiate away from the ends of the block.

2) There is a supermassive black hole at its heart.

At the very center of the Galaxy, right at its very core, lies a monster: a supermassive black hole.

We know it is there due to the effect of its gravity. Stars very near the center — some only a few dozen billion kilometers out — orbit the center at fantastic speeds. They scream around their orbits at thousands of kilometers per second, and their phenomenal speed betrays the mass of the object to which they are enthralled. Applying some fairly basic math, it is possible to determine that the mass needed to accelerate the stars to those speeds must tip the cosmic scales at four million times the mass of the Sun! Yet in the images, nothing can be seen. So, what can be as massive as 4,000,000 Suns and yet not emit any light?

Right. A black hole.



Even though it is huge, bear in mind that the Galaxy itself is something like 200 billion solar masses strong, so in reality the black hole at the center is only a tiny fraction of the total mass of the Galaxy. And we are in no danger of plunging into it: after all, it is 250,000,000,000,000,000 kilometers away.

It is thought now that a supermassive black hole in the center of a galaxy forms along with the galaxy itself, and in fact winds blown outward as material falls in affects the formation of stars in the galaxy. So black holes may be dangerous, but it is entirely possible the Sun's eventual birth — and the Earth's along with it — may have been lent a hand by the four million solar mass killer so far away.

3) It's a cannibal.

Galaxies are big, and have lots of mass. If another, smaller galaxy passes too close by, the bigger galaxy can rip it to shreds and ingest its stars and gas.



The Milky Way is pretty, but it is savage, too. It is currently eating several other galaxies. They have

been ripped into long, curving arcs of stars that orbit the center of the Milky Way. Eventually they will merge completely with us, and we will be a slightly larger galaxy. Ironically though, the galaxies add their mass to ours, making it more likely we'll feed again. Eating only makes galaxies hungrier.

4) We live in a nice neighborhood...

The Milky Way is not alone in space. We are part of a small group of nearby galaxies called — get ready to be shocked — the Local Group. We are the heaviest guy on the block, and the Andromeda galaxy is maybe a bit less massive, though it is actually spread out more. The Triangulum galaxy is also a spiral, but not terribly big, and there are other assorted galaxies dotted here and there in the Group. All together, there are something like three dozen galaxies in the Local Group, with most being dinky dwarf galaxies that are incredibly faint and difficult to detect.



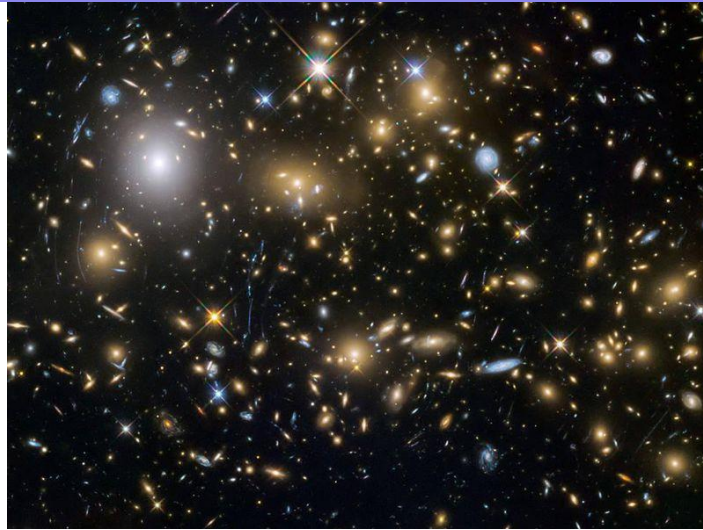
5) ... and we are in the suburbs.

The Local Group is small and cozy, and everyone makes sure their lawns are mowed and houses

painted nicely. That is because if you take the long view, we live in the suburbs. The big city in this picture is the Virgo Cluster, a huge collection of about 2000 galaxies, many of which are as large as or larger than the Milky Way. It is the nearest big cluster; the center of it is about 60 million light years away. We appear to be gravitationally bound to it; in other words, we are a part of it, just far-flung. The total mass of the cluster may be as high as a quadrillion times the mass of the Sun.

6) You can only see 0.000003% percent of it.

When you got out on a dark night, you can see thousands of stars. But the Milky Way has two hundred billion stars in it. You're only seeing a tiny fraction of the number of stars tooling around the galaxy. In fact, with only a handful of exceptions, the most distant stars you can readily see are 1000 light years away. Worse, most stars are so faint that they are invisible much closer than that; the Sun is too dim to see from farther than about 60 light years away and the Sun is pretty bright compared to most stars. The little bubble of stars we can see around us is just a drop in the ocean of the Milky Way.



7) 90% of it is invisible.

When you look at the motions of the stars in our galaxy, you can apply some math and physics and determine how much mass the galaxy has (more mass means more gravity, which means stars will move faster under its influence). You can also count up the number of stars in the galaxy and figure out how much mass they have. Problem is, the two numbers don't match: stars (and other visible things like gas and dust) make up only 10% of the mass of the galaxy. Where is the other 90%?

Whatever it is, it has mass, but does not glow. So we call it Dark Matter, for lack of a better term (and it is actually pretty accurate). We know it is not black holes, dead stars, ejected planets, cold gas — those have all been searched for, and marked off the list — and the candidates that remain get pretty weird (like WIMPs). But we know it is real, and we know it's out there. We just do not know what it is.

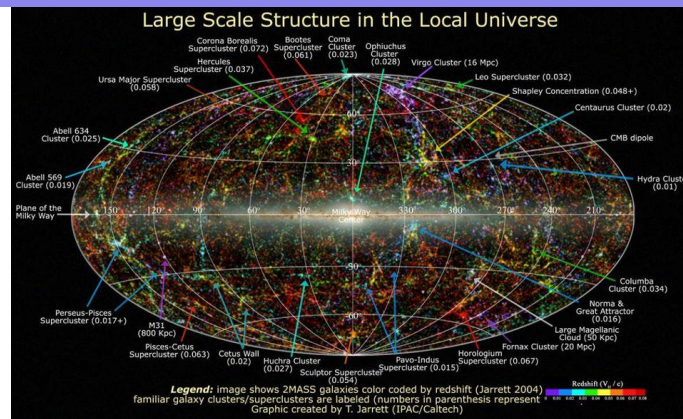


8) Spiral arms are an illusion.

Well, they are not an illusion per se, but the number of stars in the spiral arms of our galaxy is not really very different than the number between the arms! The arms are like cosmic traffic jams, regions where the local density is enhanced. Like a traffic jam on a highway, cars enter and leave the jam, but the jam itself stays. The arms have stars entering and leaving, but the arms themselves persist.

Just like on highways, too, there are fender benders. Giant gas clouds can collide in the arms, which makes them collapse and form stars. The vast majority of these stars are faint, low mass, and very long-lived, so they eventually wander out of the arms. But some rare stars are very massive, hot, and bright, and they illuminate the surrounding gas. These stars don't live very long, and they die before they can move out of the arms. Since the gas clouds in the arms light up this way, it makes the spiral arms more obvious.

We see the arms because the light is better there, not because that's where all the stars are.



9) It is seriously warped.

The Milky Way is a flat disk roughly 100,000 light years across and a few thousand light years thick (depending on how you measure it). It has the same proportion as a stack of four DVDs, if that helps.

Have you ever left a DVD out in the Sun? It can warp as it heats up, getting twisted (old vinyl LPs used to be very prone to this). The Milky Way has a similar warp!

The disk is bent, warped, probably due to the gravitational influence of a pair of orbiting satellite galaxies. One side of the disk is bent up, if you will, and the other down. In a sense, it is like a ripple in the plane of the Milky Way. It is not hard to spot in other galaxies; grab an image of the Andromeda galaxy and take a look. At first it's hard to see, but if you cover the inner part you will suddenly notice the disk is flared up on the left and down on the right. Andromeda has satellite galaxies too, and they warp its disk just like our satellite galaxies warp ours.



10) Andromeda galaxy

The Andromeda Galaxy and the Milky Way are approaching each other, two cosmic steam engines chugging down the tracks at each other at 200 kilometers per second. Remember when I said big galaxies eat small ones? Well, when two big galaxies smack into each other, you get real fireworks. Stars do not physically collide; they're way too small on this scale. But gas clouds can, and like I said before, when they do they form stars. So you get a burst of star formation, lighting up the two galaxies.

In the meantime, the mutual gravity of the two galaxies draw out long tendrils from the other, making weird, delicate arcs and filaments of stars and gas. It is beautiful, really, but it indicates violence on an epic scale.

Eventually (it takes a few billion years), the two galaxies will merge, and they form a giant elliptical galaxy when they finally settle down.

Fun Facts Corner

#1. There are somewhere in the region of 100 to 200 billion galaxies in the universe.

#2. Through study of galaxies, scientists can confirm black holes.

#3. The Sun travels around the milky way at about 500,000 miles per hour.

Power Words

Light year: a unit of length in astronomy equal to the distance that light travels in one year in a vacuum or about 5.88 trillion miles (9.46 trillion kilometers)

Dwarf planet: a celestial body that orbits the sun and has a spherical shape but is not large enough to disturb other objects from its orbit.

Black hole: a celestial object that has a gravitational field so strong that light cannot escape it and that is believed to be created especially in the collapse of a very massive star.

Virgo Supercluster: a mass concentration of galaxies containing the Virgo Cluster and Local Group, which in turn contains the Milky Way and Andromeda galaxies

Article adapted from:

http://blogs.discovermagazine.com/badastro_nomy/2008/03/12/ten-things-you-dont-know-about-the-milky-way-galaxy/