

Heavenly News
Cameron Park Rotary Club Community Observatory
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The Local Group

If you step outside on a clear night with minimal light pollution, and look up, you'll see endless pinpoints of light scattered throughout the sky. There will be stars, far too many to count, and possibly a few planets. If you have excellent eyesight, you might even be able to see a few fuzzy blotches scattered throughout the sky, which are clusters and nebulae. All of these objects, including the Earth and the Sun, are contained within something called the Milky Way. To many, this is a familiar term (hopefully *not* from the candy bar). It is often referred to as the thin milky band of soft light stretching across the entire sky, approximately from south to north. However, this band is, in fact, only the majority of the Milky Way. This "Milky Way" (in the literal sense) is in fact a galaxy, which includes nearly all of the objects you can see in the night sky with the naked eye.

A galaxy is a gigantic, swirling collection of gas, dust, and stars. All objects in a galaxy revolve around the central, massive bulge, containing what is believed to be a supermassive black hole. Galaxies exist independently of each other, and slowly travel through the universe over the course of billions of years. The Milky Way is classified as a spiral galaxy. This means that at the center of our galaxy (the Milky Way), there is a big, circular bulge, with two wide, but very flat "arms", that spiral outward from the edge of this central bulge. Looking edge-on, the Milky Way appears like an upside-down dinner plate (from the side), very thin with a raised center. It is in this manner that the Milky Way appears, spread out across the night sky. This is because, just like with the dinner plate, we view the Milky Way from the side, as the Earth is positioned in one of the arms of the galaxy, closer to the far edge than the center. However, unlike a dinner plate, our galaxy is of a much larger scale- about 100,000 light years across, or 5×10^{17} miles (5 with seventeen zeros following).

Our galaxy is a part of a complex called the Local Group. To many people, the term "Local Group" may sound nebulous, but, to astronomers, the phrase has a specific and important meaning. The astronomer, Edwin Hubble, in his book, *The Realm of the Nebulae*, first coined the phrase "Local Group". He defines that "The triple system," referring to the three major galaxies in the Local Group, "together with a few additional nebulae, forms a typical, small group that is isolated in the general field of nebulae. These members of this *local group* furnished..." As obscure as this definition may seem, pulled out of an entire book of intriguing hypotheses, its importance is truly astronomical.

But, what is this local group, and what other galaxies are in it? Hubble thought that there must be galaxies other than the Milky Way visible in the night sky. Therefore, he scoured the research of other astronomers, and found their observations of other spiral-shaped objects that he speculated must be galaxies like the Milky Way. Out of the hundreds of objects that he thought were galaxies, two interested him in particular. One resided in the constellation (region of the sky) Andromeda, while the other existed nearby in the constellation Triangulum. Despite appearing to reside near the stars in their respective constellations, the galaxies are actually nearly half a million times as far away as some of

the stars in the sky, and therefore outside of the Milky Way. Both Andromeda and Triangulum *appeared* larger and brighter than their counterparts (other galaxies scattered throughout the sky), but Hubble was the first to reason that these galaxies appeared larger and brighter, because they were *closer* than all the other galaxies that he had found. Using modern technology, we have confirmed that both of these galaxies are exactly as Hubble hypothesized, being only about 2-3 million light-years away, a relatively small distance on the galactic scale. The Andromeda Galaxy is a huge spiral galaxy, with a circular core, and is about 120% of the size of the Milky Way. The Triangulum Galaxy is another spiral galaxy, but merely half the size of the Milky Way. These three galaxies (Milky Way, Andromeda, and Triangulum) are by far the largest galaxies in the “local” portion of the universe, and for this reason Hubble called them the “Local Group”.

Edwin Hubble truly started a revolution of galactic thought. Over the course of the following decades, astronomers have discovered many more components of the Local Group, but all are either satellite galaxies (small galaxies orbiting the three major components), or very tiny dwarf galaxies. Therefore, the size of the Local Group has increased to more than thirty galaxies, but the three major, and by far the largest, galaxies that Hubble first classified have retained the same classification. This structure truly is a “group”, because all of the components therein gravitationally interact with each other. Now that we understand the dynamics of our group, astronomers have discovered many other groups, and have been able to achieve even greater classification, identifying structures such as superclusters (clusters of groups) and even groups of superclusters (massive but intricate structures of countless galaxies), all thanks to the original advancements of Edwin Hubble, and the establishment of our Local Group.

Please visit us at the Cameron Park Rotary Club Community Observatory It's always free and open 8:00-10:00 pm in September on Fridays, Saturdays, and Sundays. For open/close status please check www.communityobservatory.org or you may call the observatory at (530) 344-5707 for a recorded message. We also hope you will “Like” the Cameron Park Rotary Community Observatory on Facebook.