

13.17: Dark Matter

Dark Matter is matter believed to exist from its observed gravitational effects. We have never seen any light or energy from Dark Matter, yet we can “see” the effects of Dark Matter. Dark matter neither emits nor absorbs light, which is our primary means of observation. And it appears that this unseen Dark Matter is the vast majority of mass in the Universe. How do we know Dark Matter is there in the first place? We can **weight a galaxy** — look at the gravitational effects on objects in a galaxy. Does it match up with what we are seeing? We can also observe the **Mass-to-Light ratio**: the amount of mass versus the amount of light, which we observe.

It is important to understand Dark Matter if we want to ponder the fate of the Universe. Astronomers believe there are two possible scenarios: the Universe will continue to expand or the Universe will collapse, called the **Big Crunch**. The Big Crunch will occur if there is no or not enough Dark Matter.

The Milky Way's Mass-to Light Ratio

We only see about 10% of the mass of the Milky Way; 90% of the mass is unseen, thus, the term **Dark Matter**. In the 1930s, Fritz Zwicky first proposed Dark Matter in the galaxies. At first it was not readily accepted, but as astronomers realized the need to find the source for the Milky Way's (and other galaxies) missing matter, the concept of Dark Matter made sense. Galaxy mass physics shows Dark Matter exists. The challenge now is devising a method and instrumentation to physically observe Dark Matter.

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