

13.5: Hubble's Major Contributions



California Institute of Technology, Mt. Wilson ObservatoryPublic Domain | Image courtesy of NASA.

Edwin Hubble was hired to work at the new Mt. Wilson observatory in 1919, studying cloudy patches called nebulae.

American astronomer Edwin Hubble made three major contributions to the field of galactic astronomy.

First Contribution

First, using the new 100-inch telescope at Mt. Wilson Observatory in California, he demonstrated that some of these nebulae, like the Andromeda nebula, were actually objects – galaxies – far beyond our Milky Way galaxy.

This contradicted the view at the time; the Milky Way was considered the Universe. Yet Hubble's observations of Cepheid variables in these galaxies and comparing them to Cepheids in the Milky Way led him to his controversial conclusion.

Second Contribution

Second, Hubble was the first to classify galaxies based on what he observed, from 1922 to 1923. He classified these based on shapes: elliptical, spiral, and irregular, called a galaxy's visual morphology. Hubble's classification led to his Hubble Galactic Tuning Fork or Hubble Sequence — how he thought galaxies evolve.

Third Contribution

The third contribution is Hubble's formulation of the redshift distance law in 1929, better known as Hubble's Law. The law states that the more distant a galaxy, the greater the redshift. We can determine a galaxy's receding velocity by its redshift— *most of the time* . (Receding velocity is how fast the galaxy is moving away from us.)

$$V = H_0 d$$

Where:

- V is the velocity
- H_0 is Hubble's constant
- d is the distance to the object

One of the ongoing controversies surrounding Hubble's Law is determining Hubble's constant, H_0 . One of the goals of the Hubble Space Telescope, named for Edwin Hubble, was to determine H_0 , which it was able to do through years of observation and data.

Rearrange the equation to find the distance:

$$d = v / H_0$$

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