

16.6: Planets, Stars, Galaxies, and Clusters

Once you get past the sizes of everyday solids, liquids and gasses, you enter the realm of astronomical objects. In our Solar System, such objects range from lowly asteroids, through dwarf planets such as Pluto or Ceres, through rocky planets such as the Earth or Mars, on up through the gas giants such as Saturn or Jupiter. However, the vast majority of the mass of our Solar System is in the Sun, the star about which everything else orbits. The Sun is a ball of gas, 300,000 times the mass of the Earth. It is composed of about 74% Hydrogen, about 24% Helium, and 2% everything else. This is a very different composition from the Earth, which is composed mostly of heavier elements. However, the composition of the Sun is more typical of the composition of the Universe as a whole— indeed, the Sun has a greater than average fraction of heavy elements!

Stars collect together into galaxies, gravitationally bound systems of millions, billions, or even trillions of stars. Galaxies themselves collect together into groups and clusters, which may themselves have thousands of galaxies. The groups and clusters we can identify are part of a filamentary structure that fills the Universe. Most galaxy groups and clusters are found in this filamentary web, with vast voids between them. On the largest scales, the universe is homogeneous. That is, if you look at one spot in the universe about a billion or so light-years across, it looks pretty much the same as another, with galaxy clusters on filaments surrounding voids.

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