Interstellar Gas Encyclopedia Article

Interstellar Gas

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For many years, scientists believed that outer **space** was an empty **vacuum**, devoid of **matter**. This misconception has been changed with the discovery that the space between **stars** and other stellar bodies is not empty. Rather, seemingly empty regions of space actually do contain matter in very tiny quantities. Interstellar gas is the most prevalent form of matter that occupies the space between celestial bodies.

Interstellar gas makes up an essential part of the formation and destruction of larger structures, like stars. About 98% of interstellar matter is gaseous, and it is estimated that approximately 5% of the total matter in the **universe** is in the form of interstellar gas. Although this is a large amount of matter, the distribution of interstellar gas can be very diffuse. In some regions, it is far less dense than the best laboratory vacuum chambers can produce.

Interstellar gas, however, is not uniformly distributed between stars. Instead, clouds of gas form that are called giant molecular clouds (GMCs). Over time, these huge clouds of gas become so massive that they begin to coalesce. As a cloud becomes more and more dense, gravitational attraction increases so that the central portion collapses and begins to release **heat**. As the **density** of the interstellar gas continues to increase in the central core, **nuclear reactions** begin, eventually forming a new star. Over time, some stars completely collapse and explode in cataclysmic reactions that release new interstellar gas into space.

Most interstellar gas is composed of the elements hydrogen and **helium**. Very recently, however, the presence of gaseous water also has been detected in a kind of interstellar gas cloud, called a nebula. A nebula is a detectable (or visible) cloud of interstellar gas. **Nebulae** appear either as dark or bright clouds of gas. Bright nebulae, or emission nebulae, glow in a manner similar to neon lights, where excited atoms of hydrogen or helium emit characteristic wavelengths (or colors) of **light**. Over 300 bright nebulae have been described, including the famous Orion and Crab nebulae. Dark nebulae, in contrast, are made visible as silhouettes against a very bright background. These dark clouds of interstellar gas block light from stars, revealing their shape to the observer. Some diffuse nebulae can reach 100 light years in diameter. A very well-known dark nebula is the Horsehead nebula, whose shape, as its name implies, resembles the head and neck of a horse.