

Star Guide: Gigantic clouds of the Milky Way

By Tony Berendsen

On Earth we can look out in the sky and see clouds in our atmosphere. They are mostly made of water molecules in a gaseous state, and can be as large as a continent. They orbit the Earth as we are carried from day to night each day. From them we receive liquid water as rain.

In the evening, away from city lights through a telescope, we can see clouds in the Milky Way; molecular clouds. They are mostly made of molecular hydrogen in a gaseous state and are the largest objects in the Milky Way. They orbit the center of our galaxy every 250 million years. From them we receive stars.

The process of water precipitating from earthly clouds and the gravitational condensing of molecular hydrogen to form stars in space are very different processes. The water in a terrestrial cloud, under the right atmospheric temperature and pressure, condenses and falls to the Earth as rain. Within the arms of the Milky Way galaxy, in the extreme cold regions of molecular clouds, gravity works with destiny to form stars. As new stars begin their life of fusion, the resulting outward pressure disperses the remaining cloud around them and they emerge into view.



Orion Nebulae in the constellation of Orion.
Photo/Simulation Curriculum

Molecular clouds are very cold, having temperatures ranging from about minus 440 to minus 370 degrees Fahrenheit, and their size can vary from a just a few light years up to 600 light years (one light year is about 6 trillion miles) with a total mass reaching several million solar masses. Molecular clouds with dimensions of more than about 15 light years are called giant molecular clouds.

Astronomers study molecular clouds to understand the process of star formation and the ever evolving state of matter in our galaxy. Sun like stars formed from clouds of hydrogen return about 50 percent back into the galaxy as planetary nebulae, giant stars release huge amounts of heavier elements as super novae, small stars hold on to their matter for great lengths of time, possibly as long as our galaxy has existed. Scientists believe about 95 percent of the matter from molecular clouds is recycled in a repeating process of forming generations of

stars.

There are many molecular clouds easily within reach of a gaze of a telescope. But, there is one 1,500 light years away that can be seen in very dark skies with the naked eye or binoculars; it's called the great nebula of the constellation of Orion – M42. It's located in the sword of the great hunter Orion just below his belt and is a favorite object for amateur astronomers.

M42 shines at a magnitude of 5.0, so it's pretty bright. But since it's a diffuse object you need an extremely dark sky to see it with the naked eye. You can find it with binoculars even if you are in a moderately light polluted area. To find it look in the early evening above the southern horizon about 8pm this time of year. The distinctive line of three stars of the belt will help guide your way, and as always the star gazing app Sky Portal is an essential resource to finding your way.

Once you have found the belt, look for a smaller vertical line of stars just below and a slight glow object within them. That glow is a giant molecular cloud, the Orion Nebulae, a member of the largest objects in the galaxy, and the birthplace of stars. If you have a telescope, the small group of stars in the middle of the nebulae are stars emerging from the cloud as the star cluster Trapezium.

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