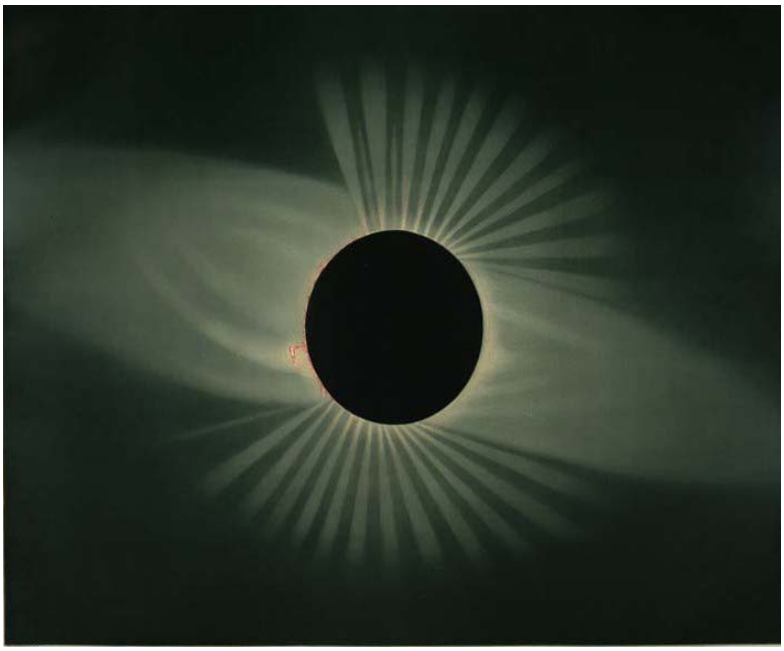
ECLIPSE NEWSLETTER



The Eclipse Newsletter is dedicated to increasing the knowledge of Astronomy, Astrophysics, Cosmology and related subjects.

VOLUMN 2 NUMBER 4
JULY – AUGUST 2018

PLEASE SEND ALL PHOTOS, QUESTIONS AND REQUST FOR ARTICLES TO
pestrattonmcag@gmail.com

MCAO PUBLIC NIGHTS AND FAMILY NIGHTS.

The general public and MCAO members are invited to visit the Observatory on select Monday evenings at 8PM for Public Night programs. These programs include discussions and illustrated talks on astronomy, planetarium programs and offer the opportunity to view the planets, moon and other objects through the telescope, weather permitting. Due to limited parking and seating at the observatory, admission is by reservation only.

Public Night attendance is limited to adults and students 5th grade and above. If you are interested in making reservations for a public night, you can contact us by calling 302-654-6407 between the hours of 9 am and 1 pm Monday through Friday. Or you can email us any time at KimGreenmcao@gmail.com or mtcuba@physics.udel.edu. The public nights will be presented even if the weather does not permit observation through the telescope. The admission fees are $3 for adults and $2 for children. There is no admission cost for MCAO members, but reservations are still required. If you are interested in becoming a MCAO member, please see the link for membership. We also offer family memberships.

Family Nights are scheduled from late spring to early fall on Friday nights at 8:30PM. These programs are opportunities for families with younger children to see and learn about astronomy by looking at and enjoying the sky and its wonders. It is meant to teach young children from ages 6-12 about astronomy in simple terms they can really understand. Reservations are required and admission fees are $3 for adults and $2 for children.

MCAO WEB SITE IS

mountcuba.org

Children's Programs Summer 2018

Date	Time	Host	Topic
Friday, May 4, 2018	8pm	Weaver	How to Choose Your Childs First Telescope
Friday, May 25, 2018	8pm	Provencal	The Solar System
Friday, June 8, 2018	8pm	Stratton	How the Earth was Made
Friday, June 29, 2018	8pm	Vincent	Constellations
Friday, July 13, 2018	8pm	King	Caroline Herschel, the Cinderella of Astronomy
Friday, July 27, 2018	8pm	Jackson	Fire and Ice in Our Solar System
Friday, August 3, 2018	8pm	Jackson	What is the Weather on Mars Today?
Friday, August 10, 2018	8pm	Hornberger	Astronomy in Other Cultures

Please contact us for reservations at 302-654-6407 between 9am and 1pm Monday through Friday. Or you can email me at KimGreenMCAO@gmail.com.

The admission fees are $3.00 for adults and $2.00 for children. A parent must attend with a child.

**Please dress appropriately for the weather conditions as the observations are outdoors. Clear skies will result in chilly to cold conditions even during the warmer months.*

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HOW TO FIND CONSTELLATIONS

Step 1. Purchase a Star Chart as shown below. Mt. Cuba Astronomical Observatory sells this one for $4.00.

Step 2. Orient the Star Chart. You will notice there are two sides to the chart. One side is for viewing the sky to the North. The other side is for viewing to the South. Let's start with the side for the North. You will notice that the white part of the chart rotates. At the bottom, you will see months. Above the month is the date and above that the time. The month and date will rotate so now line them up with the time you are ready for viewing. Simply look at the chart to pick out the object then look up at the sky. Compare the stars on the star chart and the stars you see in the night sky**.** 3. To view South, turn the chart over and turn around to face South.

UPCOMING STAR PARTIES

For more information on DAS STAR PARTIES, visit the mountcuba.org web site. Select Delaware Astronomical Society DAS.

Select Events at top and then STAR PARTIES.

WHAT ARE THE MESSIER OBJECTS?

The Messier objects are a set of over 100 astronomical objects first listed by French astronomer Charles Messier in 1771.[1] Messier was a comet hunter, and was frustrated by objects which resembled but were not comets, so he compiled a list of them, in collaboration with his assistant Pierre Méchain, to avoid wasting time on them. The number of objects in the lists he published reached 103, but a few more thought to have been observed by Messier have been added by other astronomers over the years.

For a list of Messier objects:

https://en.wikipedia.org/wiki/List of Messier objects

MESSIER OBJECT 11 – WILD DUCK STAR CLUSTER

WHAT IS A STAR CLUSTER?

Star Cluster, by definition, a group of stars that share a common origin and are gravitationally bound for some length of time. There are two basic categories of star clusters: Globular and Open (aka. Galactic) star clusters. Globular clusters are tight groups of hundreds or thousands of very old stars which are gravitationally bound, while open clusters, more loosely clustered groups of stars, generally contain fewer than a few hundred members, and are often very young.

M11, also known as the Wild Duck Cluster, is a famous open cluster located in the constellation of Scutum. It's just beyond naked eye visibility but easily visible with binoculars and an outstanding telescope object. The brightest stars form a triangle that has been likened to a flock of flying ducks, hence the name Wild Duck Cluster. Of all know open clusters, M11 is one of the richest and most compact with about 2,900 members spread over a diameter of 25 light-years.

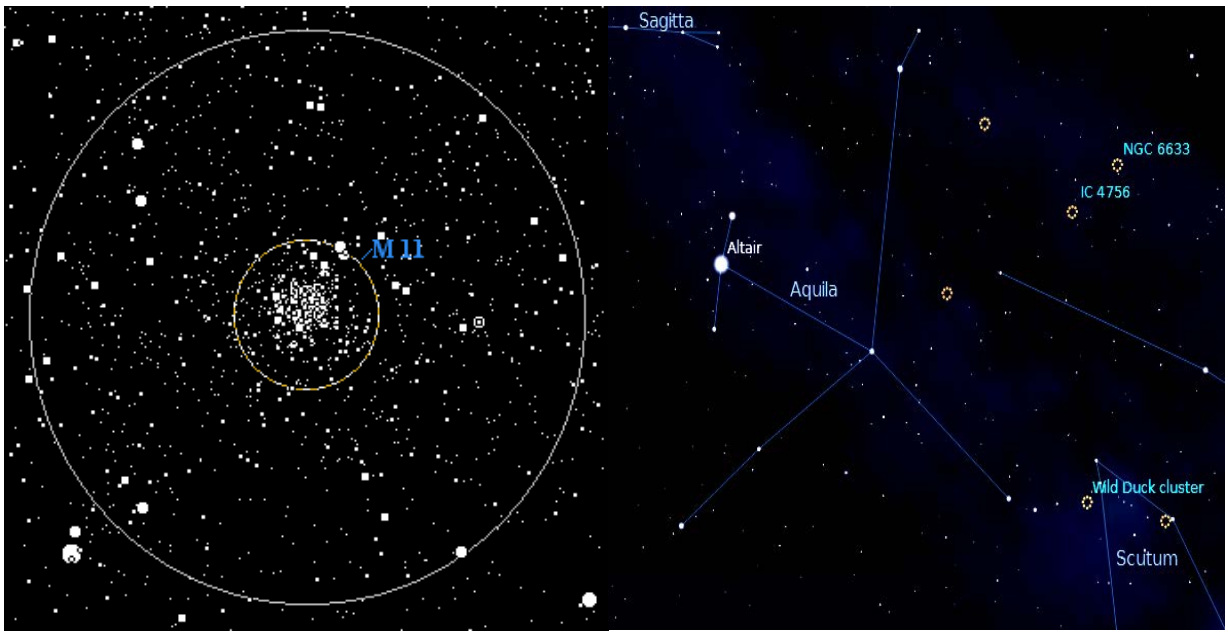
M11 was discovered by German astronomer Gottfried Kirch of the Berlin observatory in 1681. English clergyman William Derham is believed to have been the first person to

resolve it into stars (around 1733), with Charles Messier adding it to his catalogue on May 30, 1764. The name the Wild Duck Cluster was provided by British Admiral William Smyth, who imagined the distinct V shape of the cluster as a flock of flying ducks.

The cluster is an easy target to find despite been located in the small and dim constellation of Scutum, whose brightest stars are of only 4th magnitude. The starting point on the way to the Wild Duck Cluster is to locate Altair (α Aql - mag. 0.8), the brightest star in Aquila and 12th brightest in the night sky. Altair forms the southern corner of the famous Summer triangle along with first magnitude stars, Vega in Lyra and Deneb in Cygnus.

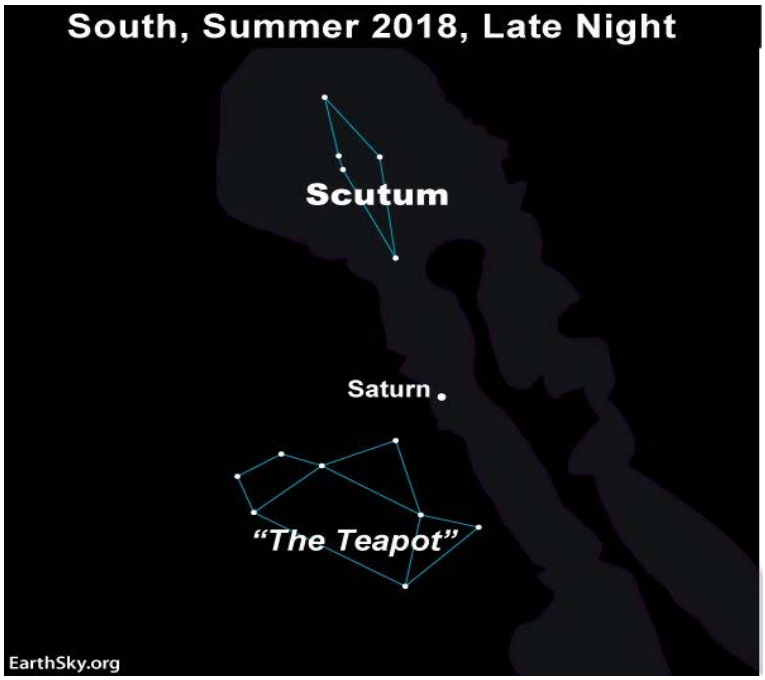
To the southwest of Altair is mag. 3.4 star delta Aql (δ Aql). First imagine a line connecting Altair with δ Aql and then curve this line southwards for about the same distance again until you reach two 4th magnitude stars, Aql and 12 Aql. Located just over two degrees west of 12 Aql is the Wild Duck cluster.

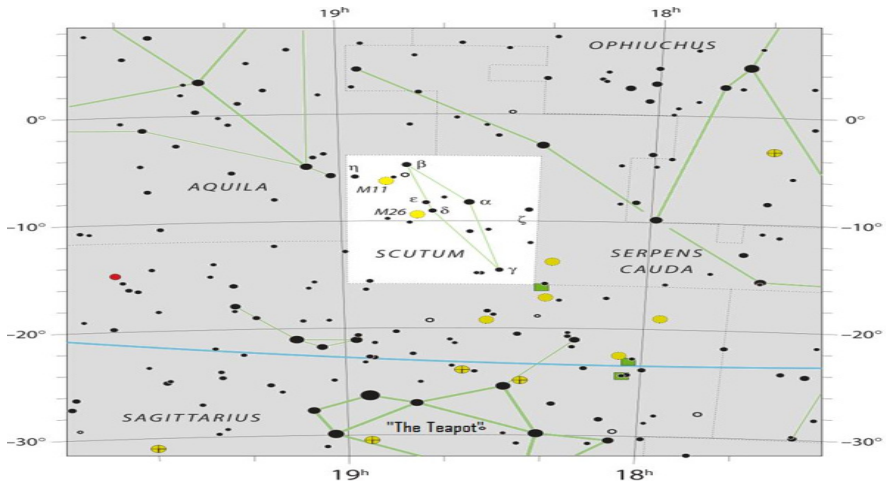
WILK DUCK STAR CLUSTER

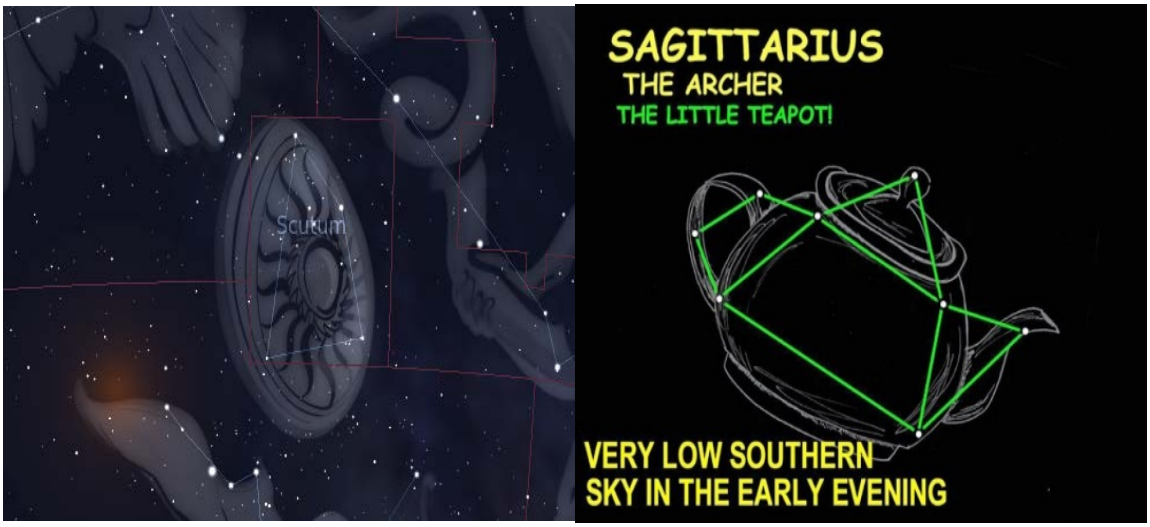


Notice location of Scutum which will help you find M11.

CONSTELLATION SCUTUM AND TEAPOT







SCUTUM AND TEAPOT CONSTELLATIONS

SCUTUM

Scutum has a fascinating history. The Polish astronomer Johannes Hevelius named it Scutum Sobiescianum, meaning the shield of Sobieski, in 1683. He named it for Jan III Sobieski, a Polish king who led his armies to victory in the Battle of Vienna. The constellation in charts of the era resembles the king's coat of arms on his shield. Today, you still sometimes hear amateur astronomers refer to this part of the sky as *Scutum Sobieski*.

Scutum is one of two constellations named after real people. The other one is Coma Berenices, named for an Egyptian queen.

The Shield isn't big, and it requires a dark sky to be seen, but – to those who find it in dark skies – it provides some very nice views with the unaided eye or binoculars. The very noticeable *Teapot* of Sagittarius is *below* Scutum. And the bright star Vega shines high above Scutum.

Some famous deep-sky objects reside in this part of the sky, too. One is the Wild Duck Cluster, also known as M11. It's an open star cluster – one of the densest ones ever found – containing some 3,000 stars.

Another open cluster in this part of the sky is M26, discovered by Charles Messier in 1764.

Bottom line: Look for the constellation Scutum the Shield. It's located in a rich region of the Milky Way and requires a dark sky to be seen.

AND THE TEAPOT.

Modern stargazers have a hard time seeing a Centaur with a bow and arrow in the constellation Sagittarius. But the Teapot – in the western half of Sagittarius – is easy to make out. The Teapot is an asterism, not a constellation, but a recognizable pattern of stars. Two noteworthy points in our sky lie in this direction: first, the center of our Milky Way galaxy and, second, the point at which the sun shines on the December solstice, around December 21 each year.

The Teapot is best viewed during the evening hours from about July to September.

On dark, moonless nights, look for the "steam" billowing out of the Teapot's spout. It's the edgewise view into our own galaxy, the combined glow of millions of stars running astride the galactic equator (see sky chart above). You'll notice that the Milky Way band appears to broaden and brighten in the direction of the Teapot. It's here that the center of our galaxy lies.

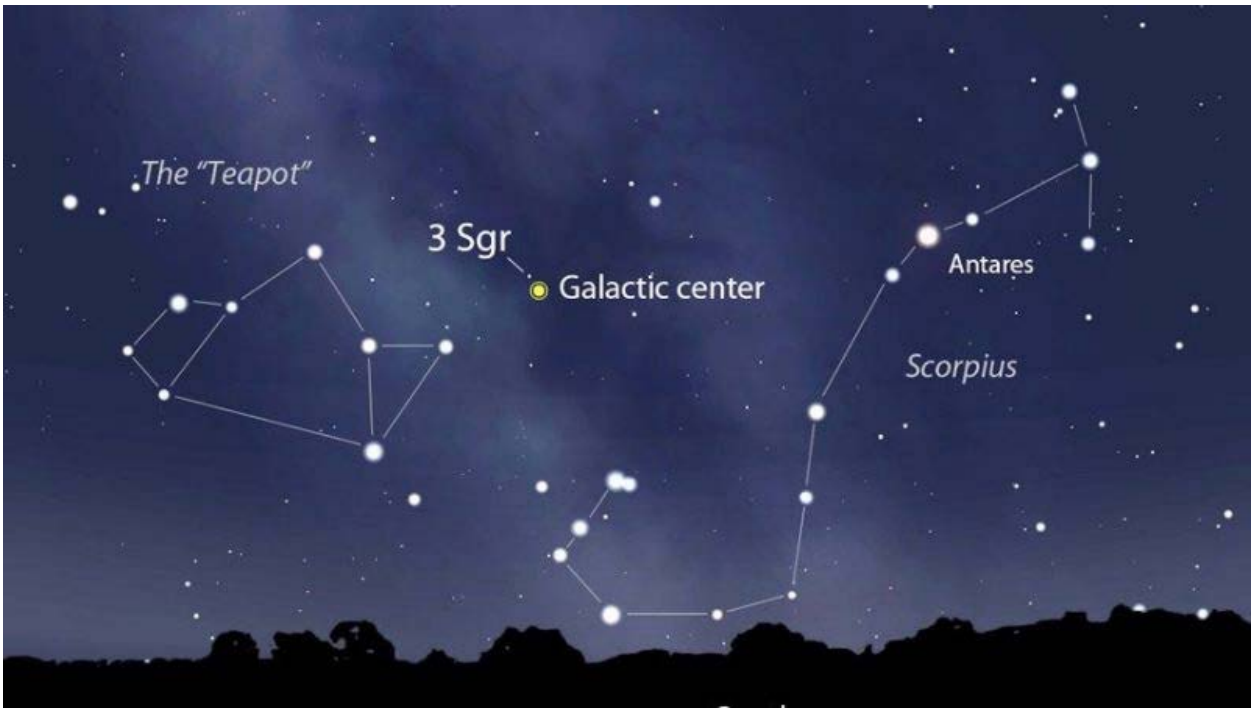
From a dark country sky, scan this river of stars with binoculars. This region of the sky is chock-full of star fields, star clusters, galactic nebulae and dust.

Because the sun passes in front of Sagittarius from about December 18 to January 20, the Teapot isn't visible then. However, about a half year later – on July 1 – the Teapot climbs to its highest point for the night around midnight (1 a.m. Daylight Time), when it appears due south as seen from the Northern Hemisphere or due north as seen from the Southern Hemisphere.

As seen from our mid-northern latitudes, the Teapot rises in the southeast about 3 hours before its climbs to its highest point, then sets in the southwest about 3 hours afterwards.

The Teapot returns to the same place in the sky about 4 minutes earlier with each passing day, or 2 hours earlier with each passing month. On August 1, the Teapot climbs to its

highest point around 10 p.m. (11 p.m. Daylight Time). On September 1, it climbs highest around 8 p.m. (9 p.m. Daylight Time). On October 1, it's highest around 6 p.m. (7 p.m. Daylight Time).



Galactic Center - the rotational center of the Milky Way.

WHAT IS A NEBULA?

The birthplace of Stars.

A nebula is an interstellar cloud of dust, hydrogen, helium and other ionized gases. Originally, *nebula* was a name for any diffuse astronomical object, including galaxies beyond the Milky Way. The Andromeda Galaxy, for instance, was once referred to as the *Andromeda Nebula* (and spiral galaxies in general as "spiral nebulae") before the true nature of galaxies was confirmed in the early 20th century by Vesto Slipher, Edwin Hubble and others.

The Horsehead Nebula.

- **The Horsehead Nebula is around 1,500 light years from Earth and is located in the constellation of Orion.**
- **Due to its recognizable shape the Horsehead Nebula is one of the most famous celestial objects.**
- **It is categorized as a dark nebula composed mainly of hydrogen gas and high levels of dust blocking out background light.**
- **The dark Horsehead Nebula is visible due to the backdrop of the bright emission nebula IC 434.**
- **Both the Horsehead Nebula and IC 434 are part of the Orion Molecular Cloud Complex, an enormous star forming region spanning hundreds of light years in diameter.**
- **The Horsehead Nebula is thought to be around 3 to 4 light years tall and 2 to 3 light years across.**
- **The Horsehead Nebula will eventually disperse due to ultra violet light from nearby stars evaporating its gas cloud.**
- **In 2001 the Horsehead Nebula was voted the favorite night sky object by amateur astronomers.**

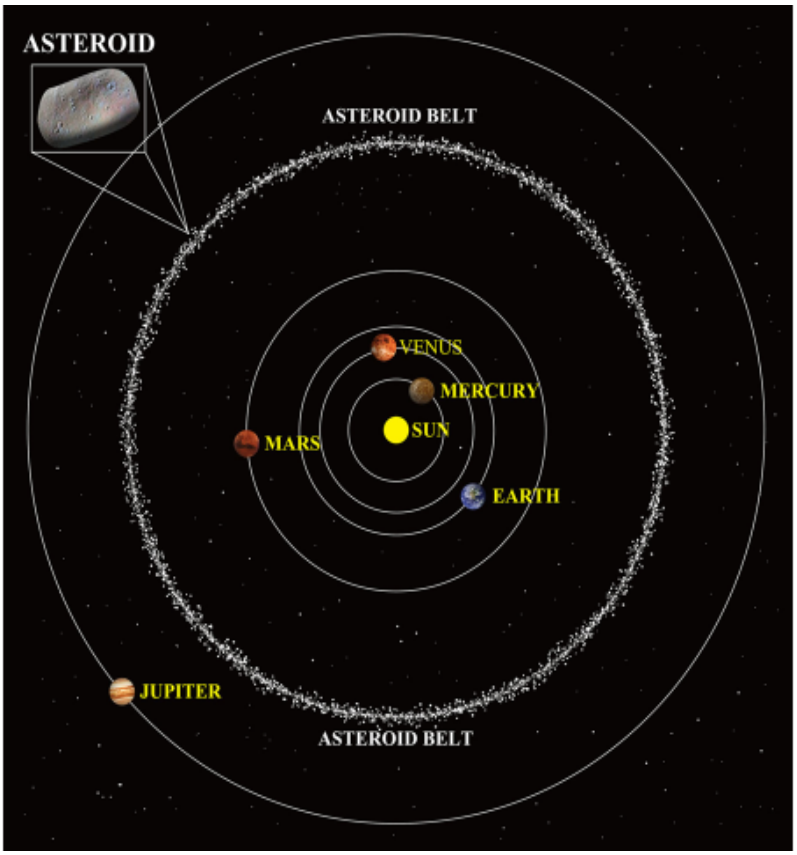
THE ASTEROID BELT

The Asteroid Belt is located in an area of space between the orbits of Mars and Jupiter. That places it between 2.2 and 3.2 astronomical units (AU) from the Sun. The belt is about 1 AU thick. 1 AU equals 1.496M Km or 93 miles. The average distance between objects in the Asteroid Belt is quite large. If you could stand on an asteroid and look around the closest Asteroid would be too far away to see.

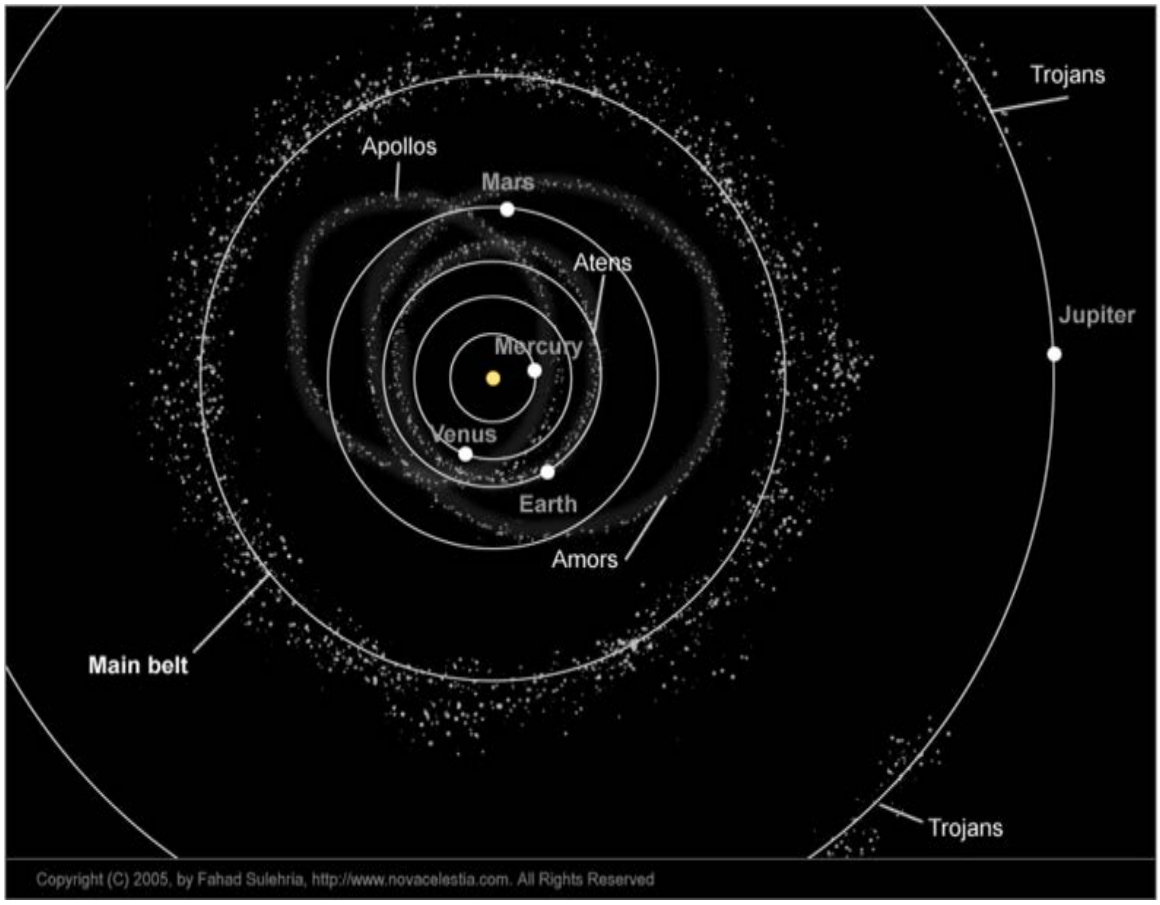
The number of Asteroids will surprise most people. There is approximately 150,000,000 Asteroids the size of a football field. Some Asteroids are much larger.

The largest Asteroid is Ceres with a diameter is 588 miles.

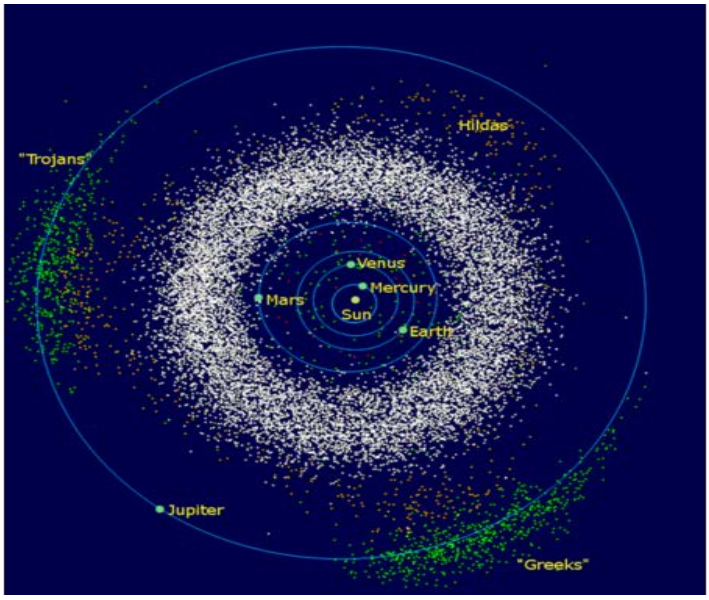
This following illustration represents what the average person thinks the Asteroid Belt looks like. A nice compact belt about half way between Mars and Jupiter with a few stray objects to the inside or outside.



You may think it looks like this.



But it looks more like this.



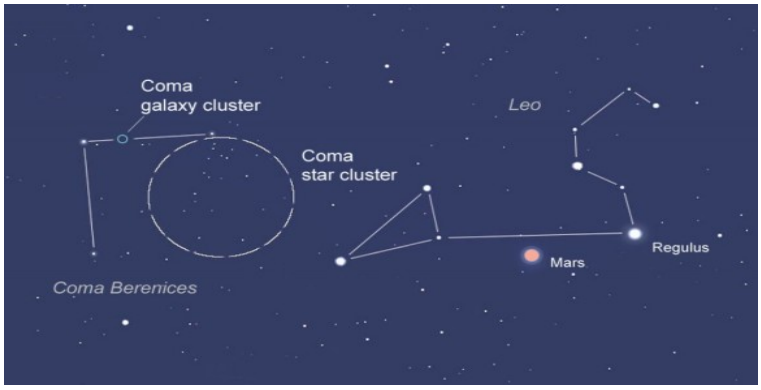
And finally, this is what it actually looks like.

GALAXY GROUPS AND CLUSTERS

Galaxy groups and clusters are the largest known gravitationally bound objects to have arisen thus far in the process of cosmic structure formation. They form the densest part of the large-scale structure of the Universe. In models for the gravitational formation of structure with cold dark matter, the smallest structures collapse first and eventually build the largest structures, clusters of galaxies. Clusters are then formed relatively recently between 10 billion years ago and now. Groups and clusters may contain ten to thousands of individual galaxies. The clusters themselves are often associated with larger, non-gravitationally bound, groups called superclusters.

COMA CLUSTER

The Coma Cluster is a group of galaxies in the faint constellation Coma Berenices, visible in medium to large amateur telescopes. Coma Berenices lies between Leo and Bootes, and as such is most conveniently viewed in the evening sky of spring and summer. The Coma Cluster is one of the richest galaxy clusters known. How many suns and how many worlds might be located in this direction of space?



Science of the Coma Cluster. The center of the Coma Cluster is about 320 million light years away, and it may stretch 20 million light years from side to side. This cluster as a whole is flying away from us at the rate of about 6,900 km/second (more than 15 million miles per hour!)

One of the most populated galaxy clusters known, it contains as many as 10,000 or more members by some estimates. 1,000 have been identified. In any case there are more individual galaxies in this cluster than there are stars visible to the unaided human eye on a clear, dark night. Most galaxies in the cluster are elliptical, although there are a few spiral galaxies. The two brightest members are NGC 4889 and NGC 4874, both of which are giant ellipticals at least 2 to 3 times larger than our own Milky Way galaxy.

Most galaxies in the Coma Cluster are dwarf galaxies, perhaps similar to the Milky Way's companions, the Large and Small Magellanic Clouds. (The **Magellanic Clouds are two irregular dwarf galaxies visible in the Southern Celestial Hemisphere; they are members of the Local Group and are orbiting the Milky Way galaxy. Because they both show signs of a bar structure, they are often reclassified as Magellanic spiral galaxies.)**

The Coma Cluster is one of the first places where observed gravitational anomalies were considered to be indicative of unobserved mass. In 1933 Fritz Zwicky showed that the galaxies of the Coma Cluster were moving too fast for the cluster to be bound together by the visible matter of its galaxies. Though the idea of dark matter would not be accepted for another fifty years, Zwicky wrote that the galaxies must be held together by some Dark Matter.

About 90% of the mass of the Coma cluster is believed to be in the form of dark matter. However, the distribution of dark matter throughout the cluster is poorly constrained. An alternative theory to dark matter is offered by A. Raymond Penner. In this theory the vacuum becomes polarized with respect to energy in the presence of a gravitational field. Unlike the dark matter theory, the induced energy polarized vacuum due to the gravitational field depends on the baryonic mass and leads naturally to the baryonic Tully-Fisher relationship (BTFR) which relates the rotational speed of galaxies to their baryonic mass.