Santa Monica Amateur Astronomy Club

December, 2016

The Observer

UPCOMING CLUB MEETING: FRIDAY, DECEMBER 9, 7:30 PM

Our meeting:

Holiday Party! Please bring any edibles you would like to share. We'll also have some astronomy posters and books to give away.

Talk: "Astronomy and the Nobel Prize"

We may also preview "Starmen".

INSIDE THIS ISSUE

Winter Skies!

OUR MEETING SITE

Wildwood School
11811 Olympic Blvd.
Los Angeles, CA 90064

Free parking:
Garage, SE corner of Mississippi & Westgate.

Image, left: The Horse-head Nebula in Orion, from the Hubble Space Telescope

Why are the Winter Skies so Beautiful?

A winter scene in Yosemite. Orion's Belt shines above the snowy granite ridge on the right. Rigel, near the ridge to the right of the Belt, shines with the brightness of 40,000 suns—unless we include its considerable ultraviolet energy, which brings it to 66,000 suns. Betelgeuse, left of the Belt, is as bright as 55,000 suns—if we include its considerable infrared light. The Gaia Satellite should finally give us reliable distances to these supergiant stars, and make these figures more certain.

The Orion Nebula, closest giant star-forming region to the sun, is just to the Belt's right—about 1,500 light years from Half Dome and El Captain.

Jupiter is the bright "star" at the top, shining just to the left of Aldebaran and the Hyades in Taurus.

Why *is* the Winter Sky so full of bright, beautiful stars?

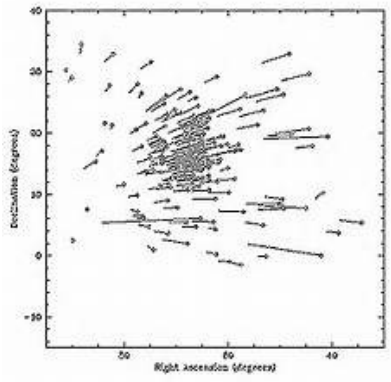
Hyades and Pleiades in Taurus

Two of the most famous star clusters enrich our Fall and Winter skies. The Hyades (left) forms the horns of the bull. Rotate the horns and you have our letter "A"—the first sign of the Zodiac giving us our first letter. At 150 light years, the Hyades is a stepping stone on the Cosmic Distance Ladder: By watching its stars converge, like train tracks toward the horizon, we can gauge its distance. Other distances are then calibrated to this cluster. When the Hyades distance was revised upward a few years back, the entire universe suddenly expanded! The Hyades Cluster is about 500 million years old, and some of its stars are already white dwarfs.

The Pleiades

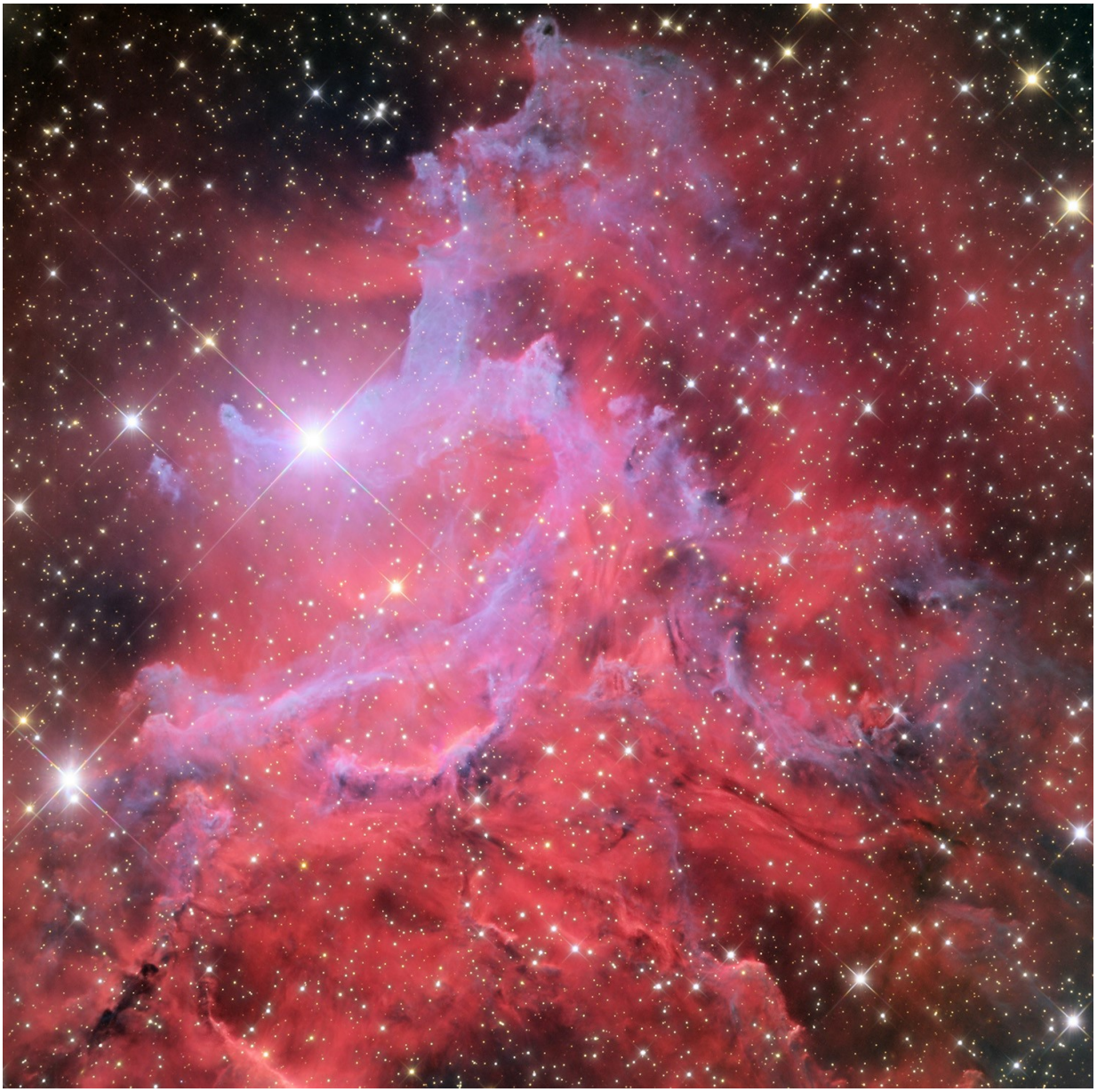
How many stars can you see in the Pleiades? They were seven sisters, but only six stand out—hence the legend of the "Lost Pleiad". On a still, dark night, you might see as many as 11. Some people claim to see many more—but some people claim to see lots of things!

The Pleiades are about 400 light years away. At 100 million years old, they long ago shed their birth-cloud, and are merely passing through a dusty region in Taurus. Some of the stars are spinning so rapidly, they are close to break-up speed. The surrounding nebulosity is blue because tiny dust grains scatter shorter wave, blue light, while longer wave, red light barrels through. That's the same reason our sky is blue—so, here's a blue sky, 400 light years from home.



Come Together!

Motions of the Hyades stars. They are moving away from us, and the stars appear, like train tracks, to be converging—here, to a point near Betelgeuse in Orion. By looking at their Doppler shifts, we know their speed away from us. Extending their paths to the vanishing point, as artists do with parallel lines, gives the distance to the cluster—about 152 light years.



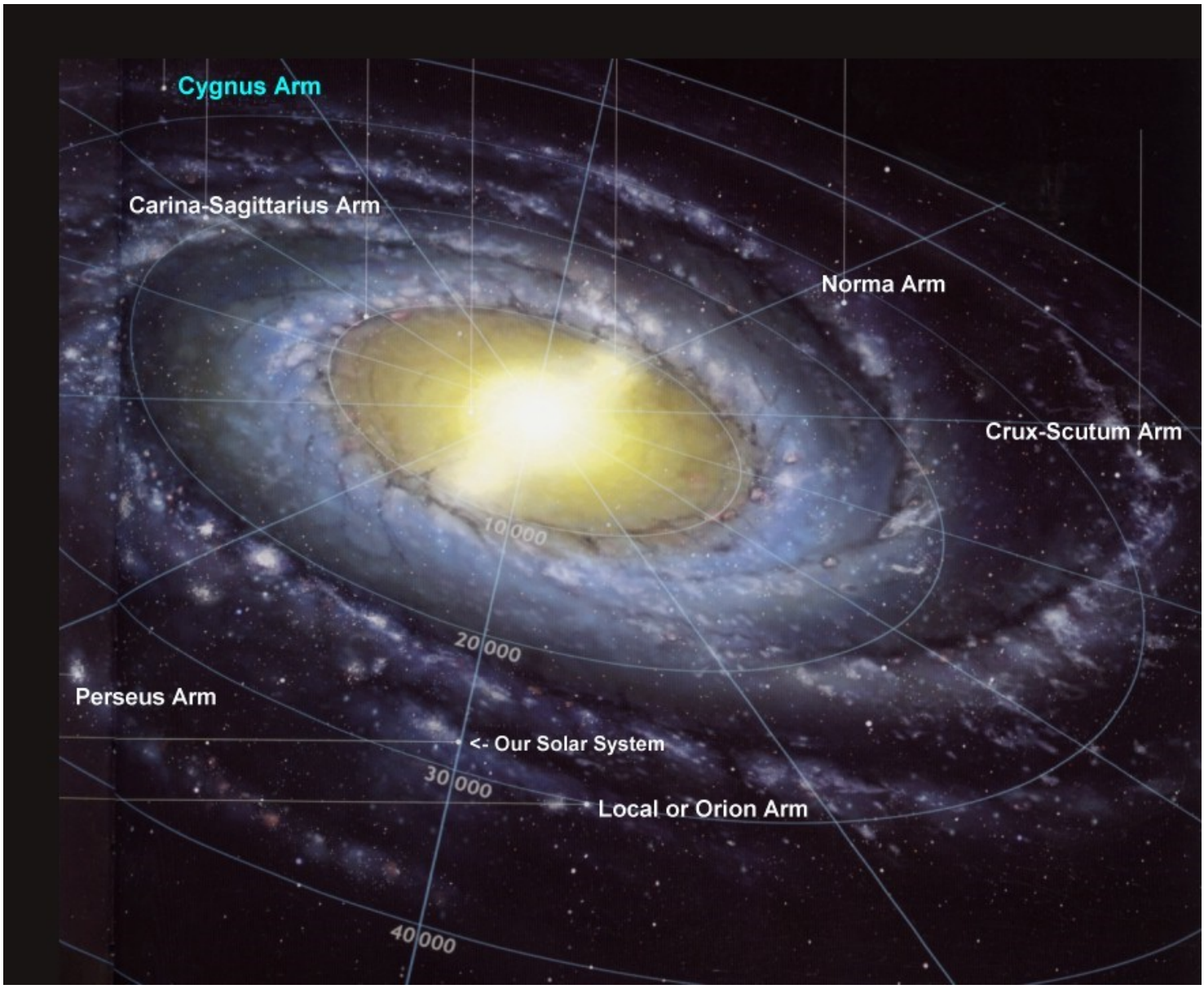
Run, run, runaway…

In the winter constellation of Auriga, we see the Flaming Star Nebula—though this sight requires a telescope, and colors through a telescope are usually subtle (but quite beautiful, in their own way).

The bright star is AE Auriga, and it's flying! Astronomers have tracked its "proper motion" amongst the background stars over the years, and it traces all the way back to the constellation Orion! Once thought to have been the companion of a supernova that blew up and released it, the star now seems to have been part of the Trapezium Cluster, which lights up the Orion Nebula. A collision with a binary star system could have released this blazing star—it's class O, reserved for stars with the hottest surfaces, about 60,000°F in this case. As with the Pleiades, the star is just passing through the nebulosity, having been born in the Orion Clouds. It leaves shock waves in its path.

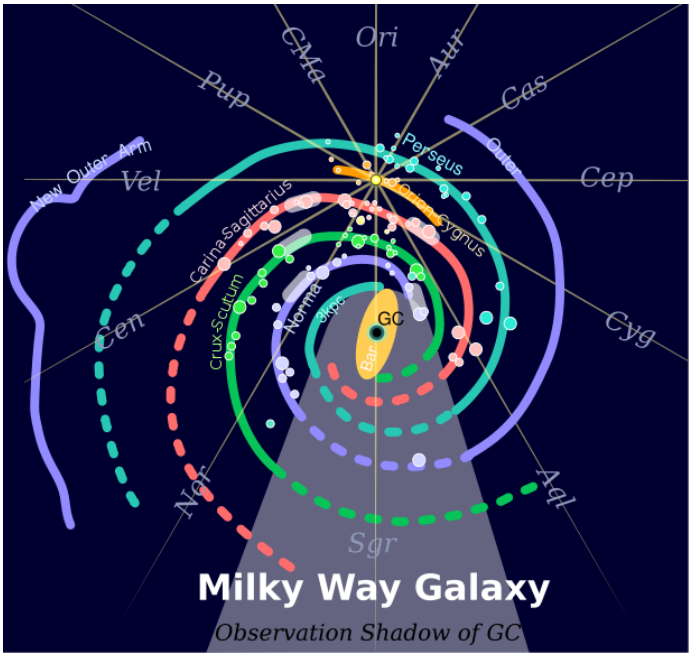
The Great Nebula in Orion

The magenta color is from the light of hydrogen atoms. The green (can you see where the two images match up?) is from oxygen. The oxygen emissions are “forbidden” — only in space do atoms stay isolated long enough to emit these colors. There is one exception: In a basement lab at NASA Ames, forbidden emission lines have been produced right here on earth.



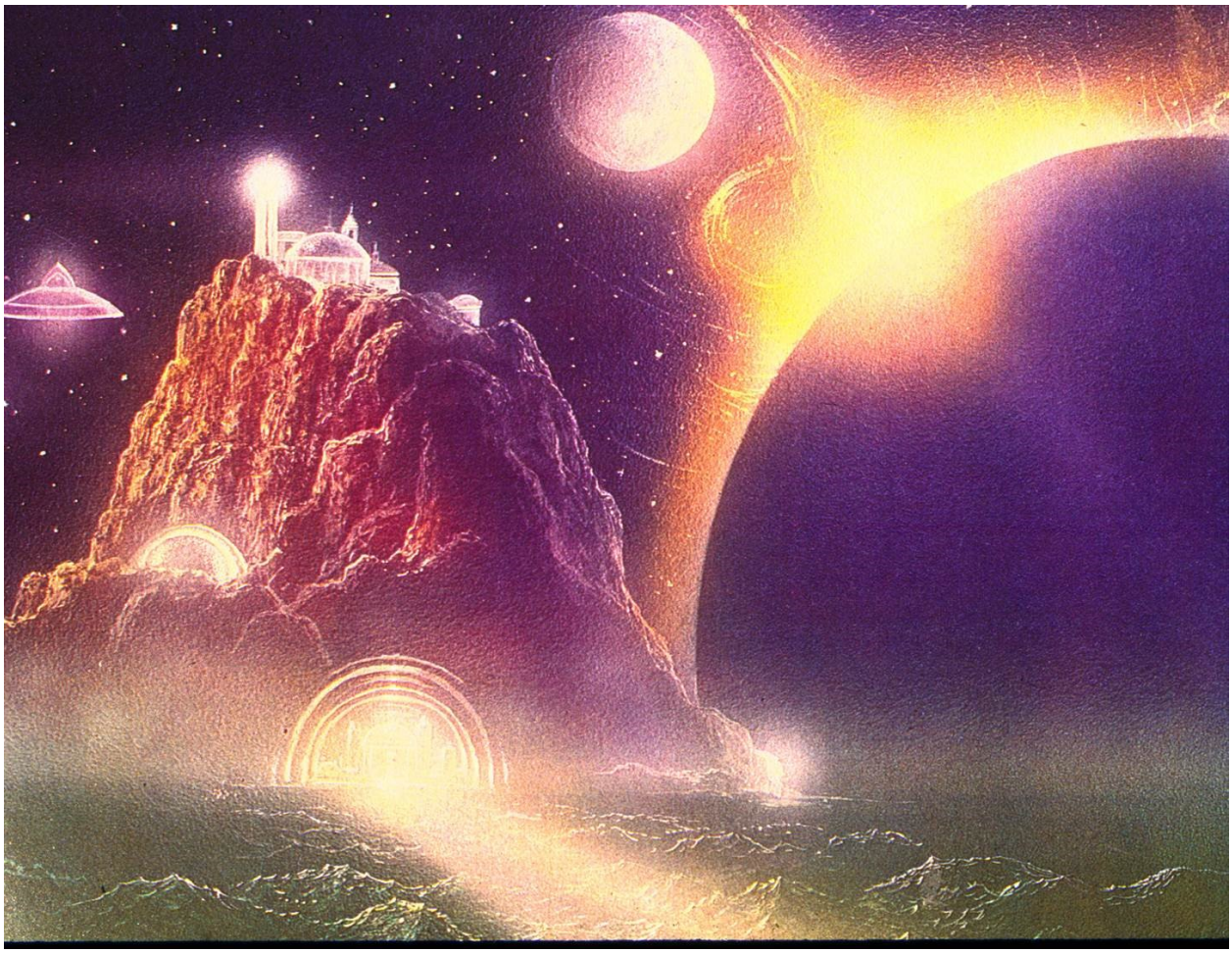
So, why are the winter stars so bright? When we look up in winter, we're looking right into the Milky Way's Orion Arm, or Spur. Great star-forming regions hover nearby, in galactic terms. Sagittarius is toward the galactic center, and Cygnus is right along the arm—hence, the myriads of stars in the Summer Milky Way. The Orion Milky Way has fewer distant stars, but more bright, close-by nebulae—and our winter stars are the progeny of those great clouds of gas and dust.

Orion's stars are actually below the belt of the Milky Way, and the stars of Scorpius, 180° away, are above (north) of it. This lopsided arrangement is called "Gould's Belt", after 19th Century astronomer Benjamin Gould, who noticed it. What's the cause? Probably a burst of local star formation, provoked by shock waves from stars in Perseus, or a supernova, or a collision between the Milky Way, and some unknown outside cloud.

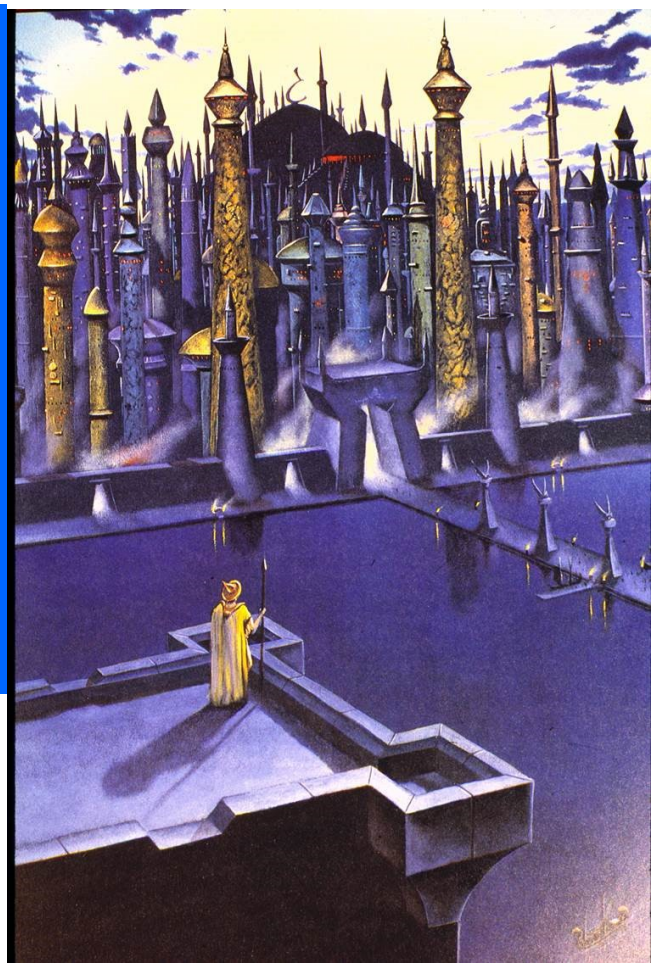


The Mysterious Cone Nebula

It was once thought that we would never be able to see inside these dark, mysterious dust clouds, where stars are born—but the Hubble Space Telescope can “see” infrared light, which penetrates the dust. Still, there are cosmic puzzles to be solved as we ponder the sights of the winter skies: How did the first stars form? How do clouds collapse to form stars in a vast pillar of dust? Is anyone out there?



From “The Star-Splitter”

by Robert Frost

You know Orion always comes up sideways.
Throwing a leg up over our fence of mountains,
And rising on his hands, he looks in on me
Busy outdoors by lantern-light with something
I should have done by daylight, and indeed,
After the ground is frozen, I should have done
Before it froze, and a gust flings a handful
Of waste leaves at my smoky lantern chimney
To make fun of my way of doing things,
Or else fun of Orion's having caught me...